



Deconstructing Digital Empowerment: The Case of Community Health Workers in India

Student name: Priyanka Pandey

Student number: 100868080

School of Business and Management

Royal Holloway, University of London

Format: Alternative thesis format

This dissertation is submitted for the degree of Doctor of Philosophy

2020

Declaration of Authorship

I Priyanka Pandey hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

Signed: __Priyanka Pandey__ **Date:** ____18/09/2020____

To the two people in my life who believed in my ability to do this doctoral study:

Vasundhara

and

Yingqin

Acknowledgement

Undertaking this doctoral project has been a long, mentally, emotionally, and financially challenging journey. Amidst these challenges, my dear school friend Vasundhara's support and motivation has been key in helping me find my way back whenever I felt lost.

In addition, the academic support and guidance that I received from my PhD supervisor has been instrumental in helping me understand my own capabilities, which I, myself did not know I possessed. She has academically pushed and challenged me in so many ways, that today I find myself in a different mould. I find myself academically more refined, and critical and constantly yearning to learn more and improve myself. I will forever be grateful and thankful to Yingqin for this.

There are also other people who supported me in different ways in this journey. I am grateful to my second PhD adviser Philip for his valuable feedback on my work. I am also thankful to my field contacts Prof. Chandwani and Dr. Seshadri for the invaluable conversations I had with them, where they enlightened me on so many aspects of my empirical study.

I am grateful to my parents and sister, for all their support and for understanding my choice of pursuing this study. My friends, Diksha, Priyanka, Saidat, Charul and Aanchal for constantly motivating me. My colleagues Amalina and Evronia, who have been a source of constant support and guidance. And last, but not the least my friend Gaurav, who in the last few weeks of writing up this thesis has helped me stay nourished with good food.

ABSTRACT

The term ‘empowerment’ is widely used to address the claims of social and economic impact by technology within developing countries. While existing research in ICT4D often links empowerment with technology, the term is used seemingly to make broad positive claims of technological change. It does not highlight how within everyday practices of human actors, the processes of empowerment come about and for whom. It also does not explicate why technology, despite claims of empowerment, leads to uneven outcomes thus widening marginalities and reinforcing inequalities. This thesis deconstructs the link between empowerment and the technology outcome. It is a thesis by publication and consists of three papers centred around three interrelated themes in relation to digital technology, namely, empowerment, power, and structure. The first paper problematises the link between ICTs and empowerment. It highlights the gaps and inconsistencies in existing ICT4D research, such as the lack of a proper conceptualisation of empowerment, the misalignment between the technological outcome and the empowerment concept and the missing concept of power and social structures that envelope empowerment processes. The second paper adopts a Foucauldian lens on power. It uncovers how technology mediates the dialectical relations between the individual capabilities of human actors and the systems of domination and control during the enactment of technology. The third paper integrates the concept of socialised affordances and social positioning from Giddens’s structuration theory. While a socialised affordance lens helps delineate the potentialities of a technology from its outcomes. The social positioning lens brings to light how structural resources, norms and rules define the social positions of human actors, and how that shapes the perceptions, use and outcomes of technology. The empirical data of the thesis comes from a qualitative case study that addresses the empowerment of Community Health Workers (CHWs) in India. It consists of 40 interviews of CHWs and other Primary Health Care centre members from 2 Primary Health Care centres, using an mHealth intervention in their routine processes. This thesis critically contributes to the narrative about the role of ICTs in enabling empowerment of individuals. It explores how power and structure shape the processes through which empowerment outcomes of technology materialise. The social outcomes of technology are mediated through power processes and social positioning of human actors in everyday practice. This sensitises us to the indeterminate and uneven outcome of technological adoption and the importance of incorporating broader social and structural processes in ICT4D research.

Keywords: empowerment, power, structure, technology, affordances, Giddens, Foucault, ICT4D

TABLE OF CONTENTS

1. Empowerment and ICT4D	1
1.1 Empowerment and ICT4D: problematisation.....	1
1.2 Gaps.....	4
1.3 Empowerment and Development: overview	8
1.3.1 Power.....	12
1.3.2 Structure	13
1.4 Research Questions	15
2. Power, Structure, Technology, and Community Health Workers	21
2.1. Power.....	22
2.1.1 Technology and Power	22
2.1.2 Power and Foucault	24
2.1.3 IS and Foucault.....	27
2.1.4 Technologies of the Self	28
2.2 Structure	34
2.2.1 Giddens's Theory of Structuration	35
2.2.2 IS and Structuration Theory	39
2.2.3 ICT4D and Structuration theory	46
2.2.4 Social Positioning.....	48
2.3. Affordances	50
2.3.1 Technology and Affordances.....	50
2.3.2 Functional Affordances	53
2.3.3 Socialised Affordances	55
2.3.4 Actualisation of Affordances.....	58
2.3.5 Ontology of Affordances.....	61
2.4 Community Health Workers and mHealth	66
2.4.1 Community Health Workers (CHW).....	66
CHWs in India.....	69
2.4.2 Community Health Workers and mHealth	74
CHWs and mHealth in India	77
2.4.3 Empirical Research Motivation	80
3. Methodology.....	82
3.1 Research Methodology	82
3.1.1 Research Design	82
3.1.1.1 Ontological and Epistemological assumptions	82

3.1.1.2 Interpretivist Frame of Research	83
3.1.1.3 Qualitative Research.....	85
3.1.1.4 Interpretive Case Study Design	86
3.1.2 Case Study: Community Health Workers and mHealth in India.....	88
3.1.2.1 Context of the Study	88
3.1.2.2 Primary Research Site: PHC centre 1	95
3.1.2.3 Supplementary Research Site: PHC centre 2.....	99
3.1.2.4 Access.....	101
3.1.2.5 Research Methods	102
3.1.3 Data Analysis.....	111
3.1.3.1 Coding Process	111
3.1.3.2 3 PhD Papers	114
3.1.4 Management of Ethics	115
3.1.5 Reflexivity and Positionality	115
4. Three Research Papers	118
4.1 Paper 1: Unpacking Empowerment in ICT4D Research.....	118
4.2 Paper 2: Power, Empowerment and Technology: A Case of Community Health Workers in India.....	119
4.3 Paper 3: Who and Where of Affordance. A Case Study of mHealth and Community Health Workers in India	120
5. Critical Evaluation	121
5.1 Propositions for Digital Empowerment Research	121
5.1.5 Integrating Power, Structure and Digital Empowerment	128
5.2 Contributions	130
5.2.1 Contribution to IS/ICT4D and Power research	130
5.2.2 Contribution to IS/ICT4D and Structure research	132
5.2.3 Contribution to IS/ICT4D and Affordance research	134
5.2.4 Contribution to ICT4D research	135
5.2.5 Empirical contribution.....	136
5.2.6 Epistemological contribution.....	137
6. Bibliography.....	138
Appendix	166

LIST OF TABLES

Table (1) Complementarities and Dissimilarities in the theoretical concepts	66
Table (2) List of maternal and child health maternal schemes	73
Table (3): Commonalities between the two research sites	92
Table (4) mHealth tablet features 1	99
Table (5) mHealth tablet features 2	101
Table (6) List of interview participants	104
Table (7) Sample field observation guide.....	105
Table (8) Sample interview topic guide	107
Table (9) List of interviewees along with their interview duration	108

LIST OF FIGURES

Figure (1) Problematising the link between technology and empowerment	15
Figure (2) Structures of domination, legitimation, and signification	37
Figure (3) Map of India showing the location of the 2 research sites of the study.....	90
Figure (4) Micro-context of the study explaining the CHW link with the PHC centre and the community.....	94
Figure (5) Snapshot of the beneficiary details in the tablet	110
Figure (6) Snapshot of the register used by the ANMs	110
Figure (7) ANMs and Male Health Workers having a meeting with the engineers	110
Figure (8) ANM using the tablet and the register to cross-check data in both	110
Figure (9) Snapshot of the different health registrations	110
Figure (10) ANM on her way to do the house visit.....	110
Figure (11) Snapshot 1 of the coding process	113
Figure (12) Snapshot 2 of the coding process	113
Figure (13) Addressing digital empowerment.....	129

LIST OF ACRONYMS

ANC	Ante-natal Care
ANM	Auxiliary Nurse Midwife
ASHA	Accredited Social Health Activist
AWW	Anganwadi Workers
BR	Biligiriranga Hills
CHW	Community Health Worker
CMHS	Centre for Management of Health Services
EHR	Electronic Health Records
ENT	Ear, Nose, Throat treatment
GIS	Geographic Information System
HIS	Health Information System
ICT	Information Communication Technology
ICT4D	Information Communication Technologies for Development
IIM	Indian Institute of Management
IS	Information Systems
ISJ	Information Systems Journal
IT	Information Technology
MCTS	Mother and Child Tracking Software
MHWs	Male Health Workers
NHM	National Health Mission
NRHM	National Rural Health Mission
PHC	Primary Health Care

PNC	Pre-natal Care
PPP	Public Private Partnership
RHUL	Royal Holloway University of London
SRA	Social Research Association
UNDP	United Nations Development Programme
VHSNC	Village Health, Sanitation, Nutrition and Sanitation Committee
WHO	World Health Organisation

Chapter 1

1. Empowerment and ICT4D

Introduction

This section will present a critical literature review of the existing empowerment and ICT4D literature. I will first highlight the discrepancies and gaps in the existing ICT4D and empowerment literature. This is done by citing certain ICT4D examples and studies that attempt to link technology with empowerment outcomes. This is followed by outlining the key definitions and debates surrounding the empowerment concept from the development literature. It showcases how the gaps highlighted in the first section, have already been acknowledged and accounted for in the existing empowerment and development literature but appear missing or weak in the ICT4D literature. The section concludes with the explanation and the motivation of the research questions and how each of the gaps will get fulfilled through the three PhD papers and research questions.

1.1 Empowerment and ICT4D: problematisation

Within the domain of ICT4D, the empowerment term is widely used to address the claims of social and economic impact by technology within developing countries. But over the course of its usage, it has come to be used more as a buzzword to airbrush some homogenous positive effects of technology leading to positive change for its users. Empowerment is a multifaceted and relational concept, which needs to be analysed through multiple dimensions. In the simplest sense, to be empowered means for a person to feel uplifted enough, to enact a change in their existing social reality. Therefore, ICT4D research should also see technology as a medium through which people can feel and be uplifted enough, to enact a change in their social reality that is valuable to them.

When it comes to ICT and its link with empowerment, it is not just about economic or legal outcomes, but also about expanding the horizons of possibility and social transformation of the underprivileged and the disempowered (Porter et al., 2020). A fundamental question in existing

ICT4D research is whether the access and provision to ICT intrinsically aids enabling the process of a developmental outcome (Sein et al., 2019; De et al., 2018; Walsham, 2017; Avgerou, 2017; Zheng & Walsham, 2008). Sometimes access to technology is seen as an empowering outcome, where for instance, access to telecentres is seen as empowering (Alao et al., 2017). However, majority ICT4D research does not theoretically delve enough in understanding what kind of empowerment is taking place? What contextual factors enable the empowerment processes through technology use? Whether the process of enacting a technology is empowering, or the outcome of technology use is empowering? From a social perspective towards technology, it becomes crucial to see how technology helps people achieve what they deem valuable for themselves. To put more simply, as ICT4D researchers we need to theoretically unpack how technology gets implicated in processes of empowerment in a manner that helps address social change and transformation at the individual, community, or state level.

Claims have been made that ICTs can enable and give individuals freedom to make choices within the political, economic, and social sphere. They are noted for reducing information asymmetry, improving governance procedures by enhancing transparency and accountability, promoting entrepreneurship and access to the job market, and reducing gender inequalities within the developing country context. Previous studies have shown that ICTs can be instrumental agents in bringing social, political, and economic transformation and empowerment (Kapondera et al., 2019; Lho et al., 2018; Bailur et al., 2018; Nguyen et al., 2017; Chew et al., 2013).

For instance, in a study conducted on the use of internet cafes by women in Egypt showcased how women in strict authoritative states were enabled through the access to computers (Wheeler, 2008). For women in the Arab world, several obstacles stand in the way of their enablement through ICT, including illiteracy, lack of access, IT knowledge, and lack of technical training. “Additional barriers to their self or skill enhancement include, powerful authoritarian states that curb the flow of online information (i.e., censorship) and restrict freedom of use (i.e., state cyberpolicing and persecution of individuals who use the web in ways it ends up threatening) in addition to issues of culture and women’s honour, which can keep women from stepping outside conservative societal boundaries and norms” (p. 90). However, in the case of the Egypt study, women were able to make friends across gender lines

and national borders through social networking sites which also helped transform their social and political awareness.

Studies around technology use by females have shown an increase in their agency and self-confidence (Maier & Nair-Reichert, 2008). Whether it is the case of rural weavers in Morocco (Davis, 2008) or female micro-entrepreneurs in Chennai, India (Maier & Nair-Reichert, 2008) effective use of ICTs has shown to enhance their capability building in numerous ways such as, building up of marketable skills or an independent income. The Economist quotes a female volunteer who helps run an ICT-based “Knowledge Centre” in Embalam near Pondicherry in India as attesting that the individual status of women in Embalam has improved as a result of using the computers. “Before, we were just sitting at home,” she says. “Now we feel empowered and more in control because we get to use technology at the centre” (Maier & Nair-Reichert, 2008, p. 45).

Then research around telecentres, GIS (geographic information systems) implementation and mobile phone use has also shown certain empowering changes for its users (Osman & Tanner, 2017). To provide knowledge and access to information, telecentres in Cape Town, South Africa were observed to become a source of individual and psychological empowerment for its users. Telecentres were installed in this region to promote literacy and access to information for citizens. Having access to world events, news, learning new skills helped them achieve confidence and the capability to apply for jobs. The users were also motivated to continue using it, as the telecentres became a social space for people to come together and learn new skills and share knowledge. The skills and knowledge were further transferred to their family members and colleagues, which in turn impacted the self-confidence and self-perception of the users as being able to do things for the community (Osman & Tanner, 2017).

Another study, done to understand the willingness of rural female farmers to pay for ICT enabled delivery of information in Ghana, revealed that female farmers found it useful to gain access to information regarding improving pest control and their crop yields through mobile phones (Okwapong, 2008). However, the study also revealed that while the farmers acknowledged that access to farming information was beneficial to their farming business, they still preferred spending their income on their household management than on purchasing mobile phones (Okwapong, 2008). Another study, conducted in Singapore studied how foreign Vietnamese brides felt an increase in confidence and autonomy by using mobile technology (Nguyen et al., 2017). As immigrants from another country, they were able to navigate through

their transnational identity and accustom to life in Singapore. The mobile phone engendered a sense of autonomy. Certain informal learning channels, such as YouTube videos with English language lessons and beauty tutorials, proved useful in dealing with the difficulties of acquiring language skills by themselves at home. Empowerment came in the form of enhanced capabilities such as English-speaking skills, personal grooming, and other educational tutorials, leading to their ability to settle into a new life (Nguyen et al., 2017).

The above include some examples of the many studies that highlight the changes that individuals or communities undergo when they use technology. However, the conceptualisation and use of the empowerment concept in existing ICT4D studies is also plagued with several gaps.

1.2 Gaps

Below I will outline four gaps that emerged from the ICT4D and empowerment literature review.

Gap 1: Misalignment between the empowerment definition and the actual empowerment outcome

Whether it is the use of mobile phones by Vietnamese brides (Nguyen et al., 2017), or the use of internet cafes by women in Egypt (Wheeler, 2008); users of technology tend to feel a change in their self-confidence and self-perception due to access to technology or the information provided by technology. While the findings of these studies reveal agency level changes, the theorisation of the specific empowerment type appears to be disjointed with the actual result of empowerment achieved through technology (Pandey & Zheng, 2019). For instance, out of the studies that engaged with an individual level analysis, only two studies theorised the various facets of individual empowerment where specific psychological empowerment ‘indicators’ such as perceived control, self-efficacy, self-confidence, participation, problem solving, coping, and self-determination were explained and analysed in the findings (Osman & Tanner, 2017). While in the other studies, either the definition of empowerment was missing, or even if the term was defined, it was not distilled within the results of the study (Pandey & Zheng, 2019). For instance, in the Ghanaian study of the provision of farming information through mobile phone radios to farmers (Okwapong, 2008), empowerment was defined as an increase in autonomy. The study was done to understand how access to farming information affected

female farmers in rural Ghana. There were traces of individual empowerment noticed, as the male farmers now had better access to farming information, but the findings of the study mostly focused on women's lack of involvement in the household decision making (or willingness to invest in information delivery technologies). Here the concept of empowerment used was autonomy, but the outcome focused more on the aspect of women's involvement, while there were certain linkages between the two, the evidence and result mostly appeared misaligned. A more refined connection is required between the empowerment concept used and its consequent technologically empowering outcome (Pandey & Zheng, 2019).

Gap 2: Lack of clarity in specifying the empowerment concept, as an outcome or a process

Second, there is very little clarity on defining whether the concept of empowerment used, is a process or an outcome, or both. For instance, in the case of Egyptian women using internet cafes (Wheeler, 2008), while aspects of individual change were highlighted, it was not clearly emphasised what aspect of empowerment is being studied and why? The author connoted empowerment with increase in information access and transformation of social and political awareness. But it was not clearly explained whether the process of increasing social awareness (using social networking sites, to make and explore relationships beyond regional boundaries) was empowering, thereby leading to other empowerment outcomes, such as an increased physical mobility across borders to meet new friends. Or whether technology (access to internet) became a medium to increase social awareness, in which case social awareness by itself became an empowerment outcome. It is important to delineate processes that are empowering from its actual empowerment outcome as this provides a more holistic understanding of how digital empowerment comes about for the technology user. There could be processes during the use of a technology that might be empowering such as, learning how to use the technology or engaging with the different affordances of technology e.g., texting, calling etc., but its ultimate outcome might not be transformatory (no change in status of the individual) (Hussain & Amin, 2018). For instance, despite women in rural villages being able to watch television and use a mobile phone, there is no change in their status at the household level. Women still have no control or autonomy in the household decisions. Likewise, the process of using a technology might not be empowering, such as waiting in line to use the computers at the telecentre or, waiting for the husband to let the wife use the mobile phone, but the outcome might lead to a transformatory change, such as women having more control over household decisions or being able to apply for a job through the telecentre that helps improve

one's livelihood and provide financial autonomy (Hussain & Amin, 2018). Or it could be both, where both processes and outcomes of technology use might be empowering or disempowering.

Gap 3: Lack of delineation of the specific empowerment type

Thirdly, very few studies clearly categorise what type of empowerment is taking place. By clearly identifying the type of empowerment, and evaluating it with specific indicators, ICT4D studies could move beyond general and superficial claims of empowerment and acquire a deeper understanding on the links between ICT adoption and empowerment (Pandey & Zheng, 2019).

In studies where outcomes of empowerment are categorised into different types, they were not explicitly linked with one another (Lho et al., 2018). For instance, in a South African study of ICT use, it was stated that owning a mobile phone led to economic empowerment. People were able to use mobile banking through their phones to manage their money which saved them a transportation trip to the bank. While saving money is an indicator of economic empowerment, its link to individual empowerment could have further strengthened in understanding empowerment processes from its outcomes. The same study, also separately recorded people feeling more confident and feeling safe in high crime rates, as they did not have to carry cash anymore (Lho et al., 2018). By connecting different types of empowerment (e.g., individual, and economic), a multi-level analysis of the empowerment outcome can be done, where processes of using technology (learning how to access the internet and mobile banking app) could be empowering at the individual level, but its operationalisation such as increase in money savings helps address its economically empowering outcome. This further strengthens understanding the link between technology and empowerment.

Gap 4: Lack of theorisation of power and structure

Lastly, there is a severe lack of theorisation of the enveloping social, institutional structures and power relations that permeate ICT use (Pandey & Zheng, 2019). Existing literature on empowerment, from the development and feminist studies perspective, places prime importance on the constructs of structure and power when addressing empowerment (Ibrahim & Alkire, 2007; Kabeer, 2005; Hill, 2003). However, within ICT4D literature very few studies address how the existing socio-institutional structures embedded in power relations enveloping ICT use, impact the processes of empowerment. Furthermore, many studies reveal an

undertone of a disempowerment effect that often accompany the empowerment findings, where technology essentially gives unequal effects. Yet this aspect is rarely reflected upon.

For instance, in the Vietnamese brides' example (Nguyen et al., 2017), wives (or the Vietnamese brides) felt an increase in self-confidence due to increase in knowledge attained through YouTube tutorials, but that increase in confidence was again grounded in the social approval of their husbands. The husbands were appreciating their wives being able to speak English and groom better, this in turn was bound up with the wives feeling psychologically empowered. The study, however, does not address how the patriarchal norms of husbands having power over their wives, was further reinforced through technology.

In a recent study by Porter et al., (2020) on the use of mobile phones by females in sub-Saharan Africa stated that the use of phones by females did expand their horizons of possibility such as those contemplating new training or businesses funded by small proceeds of airtime sales or using phones strategically in the pursuit of pleasure and leisure. The study also mentions the pre-existing gendered power structures which through technology became seemingly rearranged e.g., etiquette which requires men to buy airtime and call their girlfriends, or girls accessing their boyfriends' phones to check their contact lists. While the authors do acknowledge that aspects of gender empowerment were sparse, they do not theoretically delve into addressing how dominating patriarchal structures or power relations got reinforced during technology use, leading to unequal empowering and disempowering effects on women.

Technology use within the developing country context is often seen to be creating a dual and uneven effect, i.e., within the same community of users, due to existing power relations and socio-institutional structures, we observe parallel effects of empowerment and disempowerment taking place. It then becomes crucial to understand how technology not only empowers people but also becomes a medium of disempowerment. In other words, it is important to address the conceptual chains that link individual capabilities of human actors to the structures of domination enveloping technology use, and to also identify to whom power is getting transferred to, and whether empowerment occurs in a way that also reinforces the existing power structure that institutionalises inequality and marginality.

I now move on to addressing the key debates and definitions of empowerment within the existing development literature. This section will further emphasise the relevance of theoretically addressing the concepts of power and structure when applying the empowerment concept.

1.3 Empowerment and Development: overview

The concept of empowerment within the development literature is a widely debated term, which has been ascribed a wide variety of definitions and meanings in various socio-economic contexts. It has shown to be related to terms such as agency, autonomy, self-direction, self-determination, liberation, participation, mobilisation, and self-confidence (Ibrahim & Alkire, 2007; Kabeer, 2005; Narayan, 2005; Alsop & Heinsohn, 2005; Diener & Biswas-Diener, 2005; Barlett, 2004; Oxaal & Baden, 1997; Rowlands, 1997). Below I outline some of the key definitions from the empowerment literature.

Empowerment has been defined as:

“an increase in certain kinds of agency that are deemed particularly instrumental to the situation at hand” (Alkire, 2005, p. 4),

“an individual’s or group’s capacity to make effective choices, that is, to make choices and then to transform those choices into desired actions and outcomes” (Alsop & Heinsohn, 2005, p. 7),

“refers to the expansion in people’s ability to make strategic life choices in a context where this ability was previously denied to them” (Kabeer, 2005, p. 14),

“the expansion of assets and capabilities of poor people to participate in, negotiate with, influence, control and hold accountable institutions that affect their lives” (Narayan, 2005, p. 5),

“involves a process whereby women can freely analyse, develop, and voice their needs and interests, without them being pre-defined, or imposed from above, by planners or other social actors” (Oxaal & Baden, 1997, p. 6),

“includes the processes that lead people to perceive themselves as able and entitled to make decisions” (Rowlands, 1997, p. 14).

The concept of empowerment is multifaceted and applies at different levels of aggregation. Some of the key aspects grounding the empowerment concept within existing empowerment literature are firstly, empowerment is a *relational* concept (Malhotra & Schuler, 2005; Mason, 2005). People are not empowered in isolation, but in *relation* to other people. Certain groups are empowered or disempowered in relation to other with whom they interact (Narayan, 2005). For instance, within a more localised household domain, a control of resources or participation

in household decisions for women means that women are being empowered in relation to men. Or in the broader social domain, civil society is empowered in relation to the state. Empowerment in that sense, is rooted in how people see themselves i.e., their sense of self-worth (Kabeer, 2001; 1999). This in turn is critically bound up by how they are seen by those around them in society. Empowerment encompasses not only decision making or autonomy or other forms of observable action but also the meaning, motivation, and purpose that individuals bring to their actions; that is, their *sense of agency* (Kabeer, 2005, 1999; Narayan, 2005).

Secondly, empowerment is seen both as a *process* and as an *outcome*, whereby human actions, activities may be empowering as mediated through socio-institutional structures, and that outcomes of such processes result in a level of being empowered (Zimmerman & Rappaport, 1988). However, it is important to critically differentiate between empowerment outcomes from processes that are empowering. For instance, empowering processes for individuals might include participation in community organisations. Empowered outcomes on the other hand, refer to operationalisations of empowerment that allow us to study the consequences of empowering processes for instance, a more elevated social standing of an individual due to being able to participate (Barlett, 2004; Zimmerman & Rappaport, 1988). Empowered outcomes for individuals include an actual change or transformation from one state to another state which are a result of empowering processes (Samman & Santos, 2009; Kabeer, 1999).

In other words, empowerment basically entails a *change*. The aspect of change can be conceptualised both as a process and an outcome (Samman & Santos, 2009). It is a dynamic process reflecting a change from one state (gender inequality) to another (gender equality) (Gupta & Yesudian, 2006). Kabeer (1999) states that “if empowerment involves a transformation, then the outcome of an individual’s ability to act on their choice must lead to an increase in the influence that people have over something important in their lives. For instance, it is not enough for women and the underprivileged to be making their own decisions; those decisions must also lead to a real difference in the conditions under which they are living” (p. 450). Thus, the change that occurs should also be something, that is of value to the person who feels empowered. This raises the question: what conditions influence the process of empowerment? what type of conditions are people trying to change when they become empowered?

Barlett (2004) in the CARE report analyses this through distinguishing between the three elements of this transformation: means, process, and ends. The *means* of empowerment

encompass a wide range of ‘enabling factors’, including rights, resources, capabilities and opportunities. The social context including institutional rules and norms play a key role as the determinants that can enable processes of empowerment. The *process* of empowerment involves ‘making choices’ i.e., making decisions and acting upon them, and this can be accrued out by individuals or groups. Lastly, empowerment as an *end* is an effective change of people’s status or livelihoods.

While some feminist theorists (Harstock, 1998; Harding, 1995) state that empowerment is collective mobilisation against the oppressive structures of power. Some others say that empowerment begins at the level of individual consciousness slowly leading up to collective organisation and change (Samman & Santos, 2009; Zimmerman, 1995; Zimmerman & Rappaport, 1988; Rappaport, 1987). At the individual level people may need to be self-confident, self-determined, to know what they want, and to direct their actions towards a goal (Zimmerman, 1995; Rappaport, 1987). At a collective level, individuals must surmount the collective action problem, attain consensus, and take on a role either as a leader or follower. People who act as agents in their individual lives are more likely to engage in collective action, but this does not always necessarily follow; they may lack the motivation or the skills to do so as determined by the socio-institutional structures surrounding them (Samman & Santos, 2009). Diener and Biswas-Diener (2005) argue that while certain external conditions are necessary for empowerment, they are not sufficient without internal feelings of competence, energy, and the desire to act. Zimmerman (1995) feels similarly and argues that psychological empowerment which includes a belief in one’s own self-efficacy is an important aspect of subjective well-being. Positive emotions such as joy, happiness, and love—heightens people’s feelings of empowerment and, thus, the probability of them acting on their choices or impulses. Diener and Biswas-Diener (2005) contend “that the most important aspect of empowerment is not objective power but *feelings of power*, and that just because people have objective power does not mean that they will feel empowered or will act” (p. 135). Aspects of psychological empowerment can form a valuable steppingstone to broader social change. The individual experience of empowerment is expected to include a combination of self-acceptance and self-confidence, social and political understanding, and critical consciousness to reflect on one’s own state (Rappaport, 1987).

Kabeer (2005, 2001, 1999) states that for individuals to be able to act on a choice i.e., to be able to exercise on their agency, means that choices need to be real and seen. This can only happen when certain conditions are fulfilled. There must be alternatives i.e., the ability to

choose differently, because the inability to make a choice and the resulting dependence on powerful others to do so, rules out the capacity to act on one's choice. She explores these conditions through three interrelated dimensions: agency, resources, and achievements. Agency represents the processes by which choices are made and put into effect. Resources are the medium through which agency is exercised; and achievements refer to the outcomes of agency. She emphasises on the fact that, enabling people to act on their choices should entail a *transformatory* potential. Therefore, empowerment cannot only be conceptualised as a choice enactment but should incorporate an assessment of the values, norms and rules that reflect the wider context shaping and encircling the choice of the individual.

Alsop and Heinsohn (2005) envision empowerment as a process in which individuals use their agency ("the capacity to make meaningful choices," p. 8) to engage with an opportunity structures (i.e., formal, and informal institutions) in order to achieve "degrees of empowerment." Degrees of empowerment (whether an opportunity to make a choice exists; whether a person acts on the opportunity to choose; and whether the choice results in the desired result) in turn enables empowerment outcomes. "Agency can be strongly determined from people's individual assets (such as land, housing, livestock, savings) and capabilities of all types: human (such as good health and education), social (such as social belonging, a sense of identity, leadership relations) and psychological (self-esteem, self-confidence, the ability to imagine and aspire to a better future)" (p. 8), and by people's collective assets and capabilities, such as voice, organisation, representation and identity. The opportunity structure provides what might be considered 'preconditions' for the agency to be enacted.

From the above conceptualisations we can see that a process of empowerment is lacking unless it attends to people's individual capabilities to act within their institutional structures, and the various non-institutional changes that are instrumental to increasing agency. Institutional, cultural, or ideological norms can constrain people's ability to make choices and may further reinforce existing inequalities or deny that inequalities of power exist (Kabeer, 2005; Narayan, 2005). Agency in relation to empowerment then implies not only exercising choice but also challenging power relations. However, in cases where challenging existing power relations carries a heavy personal or social cost, subordinate groups may tend to accept or collude to their powerful relations (Ibrahim & Alkire, 2007). Even with the availability of facilitating conditions there is no guarantee that the powerless will use or will be able to use these tools to become empowered. Institutional transformation requires movement along several fronts: "from individual to collective agency, from private negotiations to public action, and from the

informal sphere to the formal arenas of struggle where power is legitimately exercised” (Gupta & Yesudian, 2006, p. 365).

I will now further highlight the aspects of power processes and structural conditions and its essential link to empowerment.

1.3.1 Power

Power has an essential centrality to understanding the processes of empowerment. Empowerment cannot be properly understood or measured without a valid and critical understanding of the power that is constituted within empowerment (Uphoff, 2005; Sadan, 1997). Kabeer (2005; 2001) sees power in terms of the ability to make choices. Therefore, empowerment then means to acquire the ability to make choices, which automatically means that a denial of choice, means to be disempowered. Power must be understood as working at different levels such as institutional, household, and individual. For some theorists, power is a zero-sum game where one gains the ability to challenge structures of oppression and inequality (Oxfam, 1995).

Contrariwise, Ibrahim and Alkire (2007) and Rowlands (1997) state the ability to enhance the individual capabilities of people i.e., empowering people should not be understood as zero-sum game in which individuals and/or groups compete over a finite amount of power. They categorise power in enumerating different types of gains from empowerment. In their framework, empowerment can be classified as a process in which people gain power over (resisting manipulation), power to (creating new possibilities), power with (acting in a group) and power from within (enhancing self-respect and self-acceptance). This is comparable to Oxaal and Baden’s (1997) framework of power as rooted in empowerment where ‘power over’ involves a relationship of power domination/subordination. ‘Power to’ involves power to solve problems, and acquire decision making authority. ‘Power with’ involves people organising with a common purpose or common understanding to achieve collective goals. ‘Power within’ refers to self-confidence, self-awareness, and assertiveness. It relates to how individuals can recognise through analysing their experience how power operates in their lives and gain the confidence to act to influence and change this.

Power has been a focus of theorists such as Michel Foucault (1989), Anthony Giddens (1994), Sandra Harding (1995), and Nancy Hartsock (1998), and their work provides insights into

power relationships. These theorists analyse “how the institutional practices of society reproduce and recreate systemic inequalities in power based on gender, class, race, and other characteristics” (Hill, 2003, p. 124). Social reality is constituted of social practices and meaning/knowledge systems, where every individual is located within a group and a subgroup that affects their identity. Social institutions and practices result in the reproduction of social relations over time by individuals in accordance with the social practices in which they are situated (Hill, 2003; Dreze & Sen, 2003; Sen, 1985). Hill (2003) cites Foucault’s work (1989) and states that institutionalised power is capillary in nature and is sustained within a social body and not from above. As “power penetrates more and more into our lives as individuals, it increasingly camouflages itself behind knowledge and practices that have goals, aims, and a logic of their own”. It is embedded in the shared knowledge and communication of customs, culture, religion, ideology, unspoken rules of behaviour, and institutionalised systems of rewards and penalties” (Hill, 2003, p. 125). Thus, power relationships then only get reinforced through the continuation of social practices. Therefore, efforts to transform existing dominating power relations should dismantle social practices and relations sustaining that very power (Rowland, 1997).

Rowlands (1997) points out that empowerment is a bottom-up process and cannot be bestowed from the top down. When it comes to addressing empowerment for the underprivileged, it is not only about opening-up access to decision making, but also must include processes that lead people to perceive themselves as able and entitled to occupy that decision-making space (Barlett, 2004; Oxfam, 1995; Rowlands, 1995). Individuals rightly should be active co-participants in shaping their life conditions. Empowerment research should then contribute towards the creation of a critical social consciousness by exposing unequal power relations and unilluminated levels of oppression and discrimination (Oxfam, 1995). Addressing power as embedded within institutional and social practices becomes imperative to address empowerment.

1.3.2 Structure

The conceptualisation of empowerment by many empowerment theorists also highlights the aspect of social context and its relevance in conditioning and preconditioning individual and collective change. The social and institutional climate plays out at multiple levels (individual, community, state, national, global) and creates incentives for action or inaction (Ibrahim &

Alkire, 2007; Narayan, 2005). Key formal institutions include “the laws, rules, regulations, and implementation processes upheld by states, markets, civil society, and international agencies. Informal institutions include norms of social solidarity, superiority, social exclusion, helplessness, and corruption that can subvert formal rules. At the micro level, empowerment is embodied in the idea of self-efficacy. At the institutional and aggregate levels, this emphasises participation and inclusion” (Narayan, 2005, pp. 8-9). Empowerment may be described as the ability of an individual to effect change. But one cannot understand the extent to which an individual can enact change, without relating to the existing structures of control that the person reinforces, interprets, and changes through their behaviour (Ibrahim & Alkire, 2007; Alsop & Heinsohn, 2005). “Personal efficacy draws its strength from structural forms of control that are embedded in social systems” (Clegg, 1989 cited in Sadan, 1997, p. 150). Hence, the empowerment process depends on what already exists in the society, but the success of the process is defined by what and how much change is achieved with respect to the social systems connected with the process at a micro, macro and meso level. There is a high interdependence between the individual and structural change in the processes of empowerment (Sadan, 1997). According to Kabeer (2005) and Alsop and Heinsohn (2005), social and institutional structures are responsible for shaping the interests of individuals which in turn define their goals and the things they value as reflected in their social positioning and individual histories, tastes, and preferences. The aspect of individual choice then incorporates structural dimensions. Therefore, if there are alternatives available to an individual to be able to effectively enact a choice then that is instantiated through structural conditions. A consequence of enacting the choice then relates to the extent to which the choices made, have the potential for transforming these structural conditions (Ibrahim & Alkire, 2007).

As empowerment is a relational concept, it emerges from the interaction between the rights, rules, resources, and incentives as well as the norms, behaviours, and processes governing the interactions between disempowered and powerful actors (Mason, 2005). Therefore, empowerment research needs to be sensitive in the ways the context will shape the process of empowerment. For instance, access to new resources may open new possibilities for women, but they are unlikely to seek to realise these possibilities in uniform ways. Instead, they will be influenced differently by their respective intersection of social relations and cultural and institutional contexts (Dreze & Sen, 2005; Sen, 1985).

A certain degree of empowerment at one level does not necessarily reflect the same degree of empowerment at other levels. Individuals or communities empowered at the local level are not

necessarily empowered at the intermediary or macro level. Therefore, in order to realise empowerment processes, it is necessary to address and unpack reinforcing systems of meaning, power, and legitimation at the level of the social structure (Hill, 2003; Sadan, 1997).

1.4 Research Questions

The previous section on empowerment highlighted the importance of social structures and power relations as embedded in the social context. Empowerment essentially cannot be understood or explained without illuminating the interplay of structure and power processes i.e., the social context with the human actor (Ibrahim & Alkire, 2007; Alsop & Heinsohn, 2005; Kabeer, 2005; Narayan, 2005; Malhotra & Schuler, 2005; Hill, 2003). Similarly, digital empowerment should also be analysed by examining the interplay of the social context with the human actor during technology use. Yet existing ICT4D and empowerment studies are lacking in addressing both these aspects as highlighted in GAP 4 before, or the fact that empowerment can be both a process and an outcome as highlighted in GAP 2, or that empowerment is relational and entails a transformatory change also highlighted within GAP 2 and 4.

The social context forms an important determinant that enables the process of empowerment and shapes technological outcomes (Lho et al., 2018). A technology artefact's capability to empower human actors or reinforce existing structures of power is also then shaped by the social context. Consequently, I conceptualise my broad research question as:

how is technology implicated in processes of empowerment?

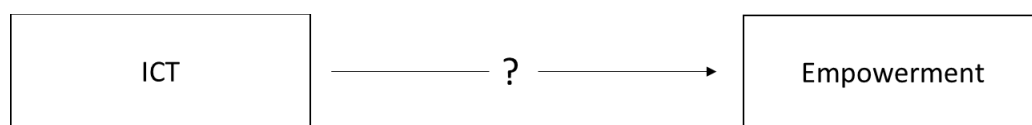


Figure (1) Problematising the link between technology and empowerment

To understand the ‘how’ and the ‘process’ of digital empowerment as depicted in figure (1) above, I specifically address the contextual conditions enveloping technology use in this research. This should help me unravel both the process and the outcome of technology use which could be either empowering or disempowering, or both, for its users. Hence, I see

empowerment both as a *process* and as an *outcome*. Next, I adopt a relational view towards empowerment and technology in this research. People are not empowered in isolation, but in *relation* to other people (Narayan, 2005). So, I see empowerment of individuals taking place in relation to other people during technology use. This is also critically bound up with how people see themselves i.e., their self-worth. While mainstream empowerment literature sees aspects of self-worth as a sense of agency (Samman & Santos, 2009; Ibrahim & Alkire, 2007; Kabeer, 2005), in this research I use the term *individual capabilities* to address the individual-level changes human actors experience when using a technology.

Agency within the empowerment literature, has been largely defined as the ability of the human actor to make a purposeful choice (Kabeer, 2005; Alsop & Heinsohn, 2005). This choice can be determined by a person's assets and capabilities which could be human, social, psychological, or collective in nature (Alsop & Heinsohn, 2005). In Alsop and Heinsohn's (2005) measurement empowerment framework, capabilities are seen as something that could enhance the agency of a person. An increase in any of the capabilities i.e., "human (such as good health and education), social (such as social belonging, a sense of identity, leadership relations) or psychological (self-esteem, self-confidence, the ability to imagine and aspire to a better future)" (p. 8), is seen as strengthening a person's agency, enabling them to make a purposeful choice or enact change. I adopt Alsop and Heinsohn's (2005) perspective on capabilities in this study. I see the enhancement of a person's capabilities mediated by technology as something that could further strengthen the agency of a person to make meaningful change for themselves. Thus, I see empowerment as a transformation i.e., a *change*, where a change is a dynamic process reflecting the transformation from one state (gender equality) to another (gender equality) and is valuable to the person.

To summarise, my definition of *empowerment*, drawing upon Batliwala (1994), Zimmerman (1995), Rowlands (1997) and Alsop and Heinsohn (2005), is presented below:

Empowerment is both the process, and the outcome of the process, by which people experience a gain in their individual capabilities. This should lead people to reflect and perceive themselves as able to act on their choices/beliefs, to transform those choices into actions and outcomes that are valuable to them.

This informs my definition of *digital empowerment* as follows:

Digital empowerment is both the process, and the outcome of the process, by which people experience a gain in their individual capabilities by using digital technology. This should lead

people to reflect and perceive themselves as able to act on their choices/beliefs, to transform those choices into actions and outcomes that are valuable to them.

Such a definition of empowerment and digital empowerment begins at the individual level where one develops an increase in their self-confidence, efficacy and critical consciousness which enables them to question and reflect on their current state (Perkins & Zimmerman, 1995). However, a development in the sense-of-the-self should over time, also be externalised in various forms of change such as a change of status at the household, community, or state level (Gupta & Yesudian, 2006). An actual lasting change in the status of the individual like greater autonomy, physical mobility, remunerated labour, and a strong role in the household etc., can then also lead individuals towards a more collective change and further enhance their agency (Kabeer, 2005). If there is no change in the status of the individual, then existing forms of inequalities embedded in systems of domination and control will continue to get structurally reproduced (Gupta & Yesudian, 2006; Kabeer, 1999).

Technology as an *intervention* can be both an enabling and a constraining medium that can affect that status of individuals. The aim is to understand how and why technology leads to uneven outcomes of empowerment, where technology creates a change and enhancement in the capabilities of human actors but also reinforces existing inequalities and marginalities. I adopt a relational and processual view towards refining the link between technology and empowerment. This is achieved by addressing the constructs of power and structure that form the contextual conditions that condition technology's interaction with the human actor.

Thus, the answer to the dominant research question will be answered with the help of lenses of power and structure. Both these lenses are supported with 2 sub-research questions and backed with the empirical study of Community Health workers and their use of an mHealth intervention in 2 primary health care centres in India:

1) *How does technology mediate the relationship between capabilities of human actors and systems of domination and control?*

2) *How does the social positioning of human actors condition the outcome of technology?*

This thesis follows an alternative thesis format and has been prepared in accordance with the indications in paragraph 16, section b (1,2,3) taken from the RHUL Research Degree Regulations 2020-2021. It is a thesis by publication that gathers three academic articles that were submitted in 2019 and 2020 to both academic journals and conference proceedings. The

three papers together contain the framing, linking, and concluding material that refines the link between empowerment and technology from a structure and power perspective.

As this thesis comprises of three paper publications, the above research questions are answered through the following theoretical apparatus:

1. The first paper (Pandey & Zheng, 2019) uses Alsop and Heinsohn's (2005) measuring empowerment and Zimmerman's (1995) psychological empowerment framework to critically address **Gap 1** and **3** as highlighted before. The paper includes a critical literature review of the existing empowerment and ICT4D literature to address:

- the relevance of the categorisation of the different types of empowerment
- the relevance of the alignment between the empowerment definition and the outcome
- the gaps in the existing empowerment and ICT4D literature

Type: Conference paper (peer-reviewed)

Status: Published on 5th May 2019

Authors: Priyanka Pandey & Yingqin Zheng

This paper was published in the conference proceedings of the Working Group 9.4 of the International Federation of Information Processing (IFIP) titled Strengthening Southern-driven cooperation as a catalyst for ICT4D, in Dar es Salaam Tanzania.

My role in the paper: As 1st author I did majority of the writing. I conducted a systematic literature review of 200 technology and empowerment papers from specialist ICT4D journals, namely Information Technology for Development, Information Technologies & International Development, and Electronic Journal of Information Systems in Developing Countries; the proceedings of the series of conferences on ICT in developing countries organised by the IFIP WG9.4 and the African Journal of Information Communication and Technology. The literature review assisted me in deconstructing the link between technology and empowerment. Continuous conversations with my supervisor throughout the writing process informed the review process.

2. The second paper uses the Foucauldian lens of relational power to address **Gap 4** and answers the first research sub-question. This paper uses the lens of technologies of the self as embedded in Foucault's lens of relational power. It highlights the dialectical relationship

between the systems of control and domination (power) and the individual capabilities of human actors, as mediated through technology, within a given context. This is done by studying the use of an mHealth intervention by health workers within a PHC (primary health care) centre in India. The study generates theoretical contributions in accounting processes of power when analysing empowerment and disempowerment outcomes of technology.

Type: Conference paper (peer-reviewed)

Status: Accepted

Authors: Priyanka Pandey & Yingqin Zheng

This paper will be presented in the IFIP Joint Working Conference: The Future of Digital Work: The Challenge of Inequality, held on the 10th and 11th December 2020.

My role in the paper: As 1st author I did majority of the writing. The data collection and analysis were conducted by me. The selection of the theoretical perspective and literature review was also done by me. However, conversations and discussions with my PhD supervisor took place throughout the paper-writing process, which aided in informing the structure and argument of the paper.

3. The third paper uses Giddens's structuration theory with a specific focus on the lens of social positioning, in conjunction with the socialised affordance lens to address **Gap 4** and answers the second research sub-question. This paper addresses the importance of concepts of affordance and structure as imperative to understanding the social impact of technology in society. This is also done by examining the case of mHealth and community health workers in India, in which health workers use an android tablet to collect basic health data from their communities and report it to the primary healthcare centre. The structure-affordances framework was applied to the study, to address the simultaneous structural reproduction and mediation of change in social practices enabled by technology.

Type: Journal article

Status: Under review

Author: Priyanka Pandey & Yingqin Zheng

Journal: Information Systems Journal (ISJ)

My role in the paper: As 1st author, I did majority of the writing. The data collection and analysis were conducted by me. The selection of the theoretical perspective and literature review was also done by me. However, conversations and discussions with my PhD supervisor took place throughout the paper-writing process, which aided in informing the structure and argument of the paper.

4. Lastly, in the critical evaluation section (chapter 5) of this thesis I further integrate technology, power, structure, and empowerment and address how I have fulfilled **Gap 2**. It integrates the findings of all three papers and discusses how the research questions were answered. It also addresses the empirical, methodological, epistemological, and theoretical contributions.

Conclusion

This chapter has focused on problematising the link between technology and empowerment. It started by describing the allure around the empowerment concept by ICT4D researchers and then moved onto highlighting the 4 gaps through various examples. Following that, the understanding of empowerment from the development literature was essential in widening our gaze. It added further refinement to our understanding of empowerment, that in addition to the gaps, it is also important to address the nature of empowerment which is relational and should encapsulate a change (be transformatory). Thus, the research questions are motivated towards fulfilling the 4 gaps and refining technology's link with empowerment from a power and structure perspective. The link is further analysed from a relational, processual and transformatory view of empowerment in the critical evaluation section (chapter 5) of this thesis.

Chapter 2

2. Power, Structure, Technology, and Community Health Workers

Introduction

This chapter presents the theoretical perspectives that have been used to interpret the empirical data and for refining the link between technology and empowerment. The first section of this chapter addresses the perspective on power as adopted in this research. It highlights the existing debates and gaps within the technology and power literature and outlines the motivation for the need of a Foucauldian lens of power. The second section explains the perspective on the aspect of structure. It highlights the existing debates, gaps, and critique of Giddens's structuration theory within the IS and ICT4D literature. It then carves out the need and relevance of the concept of social positioning from the structuration theory and its relevance to refining the link between technology and empowerment. The final section of this chapter discusses the theory of technology adopted in this thesis, namely the socialised affordance lens. This section mainly addresses the existing debates and gaps and various themes of affordances within technology research. It concludes by highlighting its relevance in understanding the socio-technical characteristic of technology in this research.

As the goal of this research is to unpack and refine the link between technology and empowerment, I achieve this by placing an essential centrality to the social context surrounding the technological phenomenon. I adopt Walsham's (2006) proposition of the context as constituting of social and institutional structures and power relations embedded within it. My perspective on the human actor's agency relates to the concept of individual capabilities as adopted from Alsop and Heinsohn's (2005) measuring empowerment framework. Human actors are seen as possessing capabilities which could be social, material, psychological, economic in nature. The enabling or constraining of the capabilities is seen as affecting the agency of a person. Hence the theoretical perspectives of power and structure should enable me to understand how technology mediates the structural conditions and power processes of a social context in a manner that enables or constrains the capabilities of human actors. The focus moves from centring agency within empowerment research to instead examining how digital empowerment of human actors is mediated through the social context by technology. Thus, Giddens's structuration theory (1984) and the Foucauldian lens of relational power (1989) have

been used to interpret the contextual conditions and processes of the context enveloping the technology. Socialised affordances as the theory of technology aids in addressing the functionality of technology from a social technical perspective.

2.1. Power

In this section of the literature review, I will specify my perspective on power in this thesis. The section begins by outlining the existing debates and gaps in the technology (IS) and power literature. This is followed by highlighting the motivation of using a Foucauldian power lens and its existing contribution to technology research. After this, I bring in the Foucauldian concept of technologies of the self as the key power concept that I will be adopting in this thesis to analyse the relationship between technology and power processes and its impact on human actors. The section ends with a discussion of the motivation behind the power research sub-question of the thesis and its link to understanding processes and outcomes of empowerment.

2.1.1 Technology and Power

Power has long been considered endemic to organisational and institutional practices. Work on power and technology has shown that in practice, power processes function in unintended ways related to the social and political processes that exist in the organisations (Faraj & Azad; 2011; Doolin, 2004; Willcocks, 2004; Jasperson et al., 2002). Technology has shown to influence which organisational actions and their consequences become relatively more visible. Processes of power become “mechanisms around which interests are negotiated, counter claims articulated, and political processes explicated” (Marabelli & Galliers, 2017, p. 4)

For instance, Silva and Backhouse (2003) state that an information system reflects the power conditions in which the technology was developed in. That technology automatically embodies the rules and regulations set by the ones in powerful positions. Nyella and Mndeme (2010) explicate the tensions between the different groups involved in a HIS implementation arising from the asymmetric ownership and control of resources. They emphasise on the dialectical nature of power arising from capacity of reflexive actors and their need to control resources. Azad and Faraj (2011) bring in the lens of social power, which is constructed by organisational

actors to tilt in their favour the IT design and configuration choices during implementation. They emphasise on the aspect of agency, namely, opposing actor groups that can make strategic attempts to alter the focus of the system design in a way that serves their agenda. More recently, Tong et al., (2017) use the social power lens to state how users use their influence and power to have both direct and indirect uses of IT. They state that when a system has been assimilated within an organisation for a long period of time, contextual influences from social power may become more important than system-related factors in explaining system use behaviour. Therefore, it is important to unravel the contextual conditions to understand IS use behaviour once the technology has stabilised within the post adoptive stage.

The same is observed in the implementation of technologies meant for socio-economic development. As most information communication technologies (ICTs) are often developed in the west and consequently, more compatible with the western culture (Kenny, 2014), their implementation in developing countries gives rise to many unintended consequences in day-to-day practices. For example, women and people of the lower social class can be excluded from access to technology, thus technology becomes a medium through which the powerful reap the benefits of technology instead of the powerless (Corbett & Keller, 2004). Thompson (2003) demonstrates how the World Bank frames technology in a way that reinforces the Bank's centrality within the development sector, partly by emphasising, technocratic ways of understanding technology. It reduces the local population's unique and often contested situations to the normalising, neutral terms of the development discourse. However, in practice technology only reinforces existing views and paradigms as envisioned by developed countries who dominate and construct the discourse of development. Mumford (2006) argues that user participation can address the problems of this one-sided influence of the management (powerful) over the workforce (powerless). However, he does not consider the political background in which an information system is conceived, developed, and implemented and how this political background is reflected in the system itself. The very user-participation then is grounded in the existing political milieu that is causing problems for the users in the first place (Willcocks, 2004).

Most studies conducted on power and technology, whether in the IS or the ICT4D field, emphasise firstly, on how technology further reinforces the status quo and solidifies institutional structures of overt power. Secondly, they make visible the struggles and politics amongst the users, designers and the senior management or people in positions of power, when in theory these technologies were meant to empower the workforce or the underprivileged by

the so-called enlightened leaders (Azad & Faraj, 2011; Doolin, 2004; Doolin 1998; Bloomfield, 1995). While some studies explain how technology becomes a medium of control and reinforcement of the dominating power, they rarely delve into the subtleties of the power processes that emerge at the individual level (Doolin, 2004; 1998). Human actors constantly find themselves being further subjected to dominating rules and norms of the organisation they are a part of while using technology – yet many studies also show unintended consequences arising from technology use (Orlikowski, 2000; Orlikowski & Robey, 1991). What requires more attention is to illuminate the various subjectivities a human actor enacts during technology use, where, on the one hand, the human actor is subjected to reproduction of power, ascribing technology use to the norms and rules of the dominant rationale. On the other hand, human actors also enact technology in an unanticipated manner due to various social factors or interpretive flexibility at the individual level. It then becomes imperative to explicate this dialectical relationship between structural reinforcement of power and the individual capabilities of human actors during technology use to understand organisational/institutional change (Miller, 1987).

2.1.2 Power and Foucault

A starting point to explain the relationship between the reproduction of power and individual capabilities, becomes everyday social practices of human beings. It is social practices where knowledgeable human actors meet structures of domination and legitimation that govern their conduct and role in society (Giddens, 1984). Human actors constantly produce and reproduce these structures in their everyday routines. While human actors have agency (transformative capacity) they are also enabled and constrained by structures that shape and hold them. Agency is intimately connected with power - in fact, this is one of its defining characteristics, since the loss of the capacity to make a difference is also powerlessness (Rose, 1998). In practice, human actors almost always retain some transformational capacity – whether it is small or big depends on their ability to navigate through the structures and use of the resources at their disposal (Rose, 1998; Barbalet, 1987).

The exercise of power does not constitute a discrete act but is a regular, routine phenomenon, occurring during the practice of regular activities (Giddens, 1979). Social interaction involves the use of power as a necessary implication of the “logical connection between human action

and its capacity to transform structures” (Giddens 1981, p. 28). Ultimately, power can be conceptualised as “relations of autonomy and dependence between actors in which these actors draw upon and reproduce structural properties of domination” (Giddens 1981, p. 28). The dialectic of control recognises that relations of dependence and autonomy are relational, that while a superior clearly has authoritative and allocative resources with which to exercise power over a subordinate, the latter also has their own resources of power which can be used to either resist or submit to the superiors (Giddens, 1981, p. 30).

As highlighted by Bloomfield and Coombs (1992) and Clegg (1998) conventional conceptions of power assume that power exists as an overarching capacity that is all-possessive and exercised over others in a mechanical manner. Power is seen primarily as something that represses, coerces, or denies. Such a zero-sum notion of power implies that shifts in organisational power are the result of conforming changes in the organisational distribution of resources, such as information, which confer power on their possessors. This understanding of power can be seen in the early studies of information systems in organisations (Jasperson et al., 2002; Markus, 1981; Pettigrew, 1972). The weakness of this approach is that it fails to consider that power is relational (Clegg, 1998), that is, power is not possessed but is a capacity for action that resides in social relations subsumed in social practices. It exists only when it is exercised when it is put into action.

Such a relational conception of power is provided by Foucault (1982). According to him, power is exercised from within the social body, rather than from above it. Foucault goes beyond a perspective that centres a locus of power or on violence or resistance and instead links technologies of the self, i.e., the creation of self-perceptions and identities, with technologies of domination (exercise of power), the “constitution of the subject to the formation of the state” (Foucault, 1982, p. 3). “Institutions like the state, family, sciences, and prisons represent power in particular concentrations. They do not produce but instead relay - that is, receive, coordinate, and disperse - power” (Foucault, 1982, p. 4).

“Power thus must be analysed as something that circulates. . . that functions only when it is part of a chain. It is never localised here or there, it is never in the hands of some, and it is never appropriated in the way that wealth or a commodity can be appropriated” (Willcocks, 2004, p. 254). Power is exercised through networks, and individuals do not simply circulate in those networks: they are able to both submit to and exercise this power. In other words, power passes through individuals (Willcocks, 2004).

Foucault describes his analysis of power relations as ‘not a theory, but rather a way of theorising practice’ (Kritzman, 1988). He constantly stresses that power relations are not merely negative but productive as well. With power relations rooted in the system of social networks, there is little room for the assumption of authentic human interests or the self, outside of power relationships. Human beings are essentially social and cultural products. The human actor is one of power’s first effects even though time and again power is met with resistance (Foucault as cited in Gordon, 1980).

However, Willcocks (2004) states that if one wishes to use Foucault, one needs to use a critical view towards applying his concepts, that these concepts should not be applied verbatim but should always be further contributed to and developed by researchers. Having said that he also states that Foucauldian concepts come with their own drawbacks. Firstly, Foucault did not work out an explicit methodology that would fit the application of his concepts. Therefore, his concepts are generally always subject to the researcher’s interpretation. Too many interpretations deny Foucault’s “specificity—each work is specific to itself—and his marginality—he works at the limits of thought, trying to rethink the limits of reason” (Gutting in Willcocks, 2004, p. 264). Secondly, he placed great emphasis on researching practices empirically but his manner of creation of the narrative does not give a full explanation of the processes and appears provisional (Best, 1994). Thirdly, he studies underlying practices giving very little emphasis to human agency. If power is capillary, ever-present, and everywhere, then all social and cultural phenomena become reducible to power relations. While Foucault does focus on the possibility of resistance, he locates resistance within power itself and severely restricts agency. This then, “violates universal validity claims; it is context bound rather than context transgressing; and Foucault does not account for the normative dimension of his analysis” (Willcocks, 2004, p. 264). It is only in his later work on ‘technologies of the self’, does he account specifically for the individual self. The individual self is encroached with various subjectivities, one that is both a subject of the contextual conditions and has a version of an ethical self (Hoy & McCarthy, 1994; Honneth, 1993). Foucault’s concern by the end became how power/knowledge produces subjects and specific forms of subjectivity, i.e., practices of government and practices of the self as woven together (Foucault, 1982a).

2.1.3 IS and Foucault

Within IS research Foucault's concepts, despite the criticism it has gained, have been widely adopted. Early work includes studies of surveillance technologies (Lyon, 1994; 2003), the use of information and databases (Poster, 1990) and discipline, information use and technologies at work (Webster, 1995; Zuboff, 1988). Introna (1997) effectively utilises Foucault's power/knowledge in conjunction with Clegg's (1989) circuits of power in order to explicate several case studies of ICT implementation and use. Brooke (2002a, 2002b) offers a point of reflection for IS research and argues that Foucauldian concepts help critically inquire into topics of emancipation and power relations. Davies and Mitchell (1994) extend and enhance the use of interpretive research through Foucault by demonstrating how the history of power relations in an IT decision context influenced discourses regarding the acceptability of solutions. Doolin (1998) uses a Foucauldian perspective to highlight that when technology gets implicated in organisational practices, human actors normalise the norms and values inherent in the dominant discourse in which the technology is grounded, thus opening-up the possibility of them being self-disciplined subjects. While technology does not bring a change formal authority structures, it can be used as a medium to enhance visibility and enhance subtle power effects such as an increase in informal bases of power namely, expertise and network centrality (Doolin, 2004). Avgerou and McGrath (2007) contest privileging the technical rationality of technology use, such as software construction, administrative control, and economic gain. Instead, they focus on how resistance and problems are created which lead to a failure in meeting expected outcomes from a Foucauldian lens. Technical knowledge and political clashes in this case become an instrument of creating power networks between the management and the workforce. Poster (2001) states that exploring subjectification, disciplining, knowledge, and power relations are key to critically understanding the impact of technology. While Foucault does not deal explicitly with technology as hardware and software, he does provide a useful corrective against narrow definitions of technology and its applications. Instead of privileging material technology, he privileges the behavioural and social technologies encoded and imbedded in material technologies (Bakardjieva & Gaden, 2012; Hassan, 2011).

A Foucauldian lens helps understand the subtle power dynamics that encroach a human actor within their everyday practices. It sheds light on the subjectivities that human actors enact when

they become subjects of power while also retaining a sense of an ethical self. I will be adopting one of Foucault's later concepts namely, technologies of the self to explicate the relationship between the reinforcement of power (domination and control) systems and individual capabilities as mediated through technology.

2.1.4 Technologies of the Self

Foucault's theory of power is a useful starting point to study technologies of the self because the bodies of the self are embedded in relations of power, of everyday practices (Deacon, 2002; Foucault, 1988). Foucault maintains that fundamental to his project is understanding the role of the individual within changing power relations. In order to understand how human actors, turn themselves into a subject, it is necessary to revisit their connection with the network of power relations they are embedded in (Deacon, 2002). He states that "power both subjugates and makes subject to, as it applies itself to immediate everyday life which categorises the individual, marks him by his own individuality, attaches himself to his identity, imposes a law of truth on him which he must recognise, and which others have to recognise in him. It is a form of power which makes individual subjects" (Foucault, 1982b, p. 212).

Each human actor is, by virtue of being involved in a network of human relationships, part of relationships of power, in which they are a subject of control but also have some control over others. Human actors are both a subject and vehicle of power. It is this very partisanship that leads Foucault to further delve into analysing the subjectivity of the human subject (Kelly, 2013; Markula, 2003; Deacon, 2002).

Foucault's human actor operates simultaneously in 2 terrains: the inside and the outside. Dimensions located 'outside' of the human subject are those that revolve around how knowledge and power are subjected on human actors and how human subjects act upon each other (Markula, 2003; Foucault, 1988). However, in his later work he focuses more on the 'inside' terrain i.e., the relationship which human actors have with themselves - how the relationship with oneself can derive from power and knowledge without being dependent on them. Foucault conceptualises this relationship as the 'double' which is the interiorization of the outside, doubling of one's own relations with others, termed as 'subjectivation'. This helps us see how individuals have folded the outside forces inside i.e., practices that permit human actors to transform themselves by folding the conditions of the 'outside' subjected on them. He

advocates this involves ethical self-care, aesthetic self-stylization, and critical self-awareness (Kelly, 2013; Markula, 2003; Foucault, 1988).

The subject, then, is something that is founded on a kind of “ontological split between itself and the body, but a split that is only relative rather than substantial or absolute” (Kelly, 2013, p. 514). Thus, Foucault thinks that the question of the “subject is a matter of distinguishing a doer from the actions they carry out. The self-constitution of the subject is not the subject producing itself out of thin air, but rather shaping what is already there” (p. 514).

Foucault entails a particular historical constitution of subjectivity, that subjectivity is constituted within and through social practices. Here, subjectivity is taken to be something that varies according to what one might call a social role (Kelly, 2013). Human actors in different contextual situations act in accordance with the role they enact as embedded in social and power relationships. However, this does not mean that every time there is a change in a situation, human actors transform into a different constitution of themselves. We acquire our practices, and so they are habitual; thus, even though subjectivity is relative to practices, since practices are themselves repeated habitually over time, this implies the continuity in subjectivity (Kelly, 2013; Markula, 2003).

Foucault then moves to the aspect of being ‘ethical’, the characteristic that human actors should have in order to develop a *techne* (technique) of the self (Markula, 2003; Foucault, 1990; 1988). Ethics for Foucault can be “understood as the elaboration of a form of relation to self that enables an individual to fashion himself into a subject of ethical conduct” (Kelly, 2013, p. 517). This definition is of course very different from the one that is used to describe ethics today. Today it is generally understood as a matter of rules or principles for actions that can be labelled as ‘right’ or ‘good’ hence ‘ethical’ or ‘moral’. Here, the ethics of a human actor is connotated with the character of oneself, “the kind of relationship you ought to have with yourself, which I call ethics, and which determines how the individual is supposed to constitute himself as a moral subject of his own actions” (Foucault as cited in Kelly, 2013, p. 517). The ethical self reflects the aesthetic concern in which individuals hold the ‘will to live a beautiful life’ by applying certain values, reproducing certain examples, and depicting a virtuosity in their lives (Foucault, 1990, p. 254). The ‘care of the self’ essentially then requires an ontological enquiry into knowing oneself, the ‘self’ becomes ‘something to write about’ with vigilance to nuances of everyday life, particularly to identify faults, temptations, and desires (Foucault, 1990).

He then defines *morality* as encompassing a moral code and the behaviour in relation to that code, between which there are varying degrees of compliance in practice (Kelly, 2013; Markula, 2003). Moral codes act as guiding principles that shape the individual's self-assessment on how they should go about their lives and conduct themselves (Foucault, 1988). It is through the practices of these moral codes that individuals become ethical agents and in such ethical work, subjectivity is approached. Ethics is the relationship one has with oneself that "determines how the individual is supposed to constitute himself as a moral subject of his own actions" (Foucault, 1996, p. 263). For Foucault, the need for ethics today is not for a tool to gain mastery over others, but for something that would help human actors to obtain their own freedom. Foucault further links the aspect of freedom to spirituality. Spirituality is defined as the transformations a subject enacts through practice and experience in order to have access to the truth. But today both ethics and spirituality of a human actor are seen as something that have become lost during the constitution of society with the consequent intervention of religion and politics and hence are things that need to be bought back (Kelly, 2013; Bakardjieva & Gaden, 2012).

Ethics however are not completely determined by economic, political, and social structures, and thus that any argument that we are powerless to produce an ethical self of ourselves today will only serve to be 'self-fulfilling' (Kelly, 2013). We are not constrained only by social structures, but by our way of thinking about things. And then, we cannot simply think our way out of a problem, since it is not just a question of thought, but of techniques and practices that need to be socially produced and supported. However, a constant and obsessive focus on a moral mode of being as shaped by a version of our ethical self can itself be disciplinary in nature and develop power over us. Hence it is important to distinguish whether the practices of the care help us transform into ethical beings or simply comply with dominant discourses (Schoner, 2017; Markula, 2003; Ashton-Shaeffer, 2001).

Foucault states that his analysis of power in the 1970s itself produced the conditions for a re-emergence of ethics. Specifically, his notion of "governmentality" whereby power is understood as connected to the subject, he thinks "makes it possible to bring out the freedom of the subject and its relationship to others – which constitutes the very stuff of ethics" (Kelly, 2013, p. 523). He argues that freedom from governmentality of individualisation can take place through an everyday aesthetic stylisation of the self: a constant reinvention of the self at the level of the micro-physics of existence (Foucault, 1988; 1982b). However, his techniques of the self, excludes the essential self, that is waiting to be liberated from existing macro and

micro powers of oppression. Instead, Foucault emphasises that only through a critical awareness of the limitations of the self in one's cultural conditions can the outside be folded into the inside (Bakardjieva & Gaden, 2012; Markula, 2003).

Foucault's earlier work has been critiqued for ignoring the human actor's ability to resist practices of domination i.e., the exercise of agency (Willcocks, 2004), his work on technologies of the self does try to address change arising from the human actor's ability. As Foucault focuses more on the local, intimate operations of power, it is possible to examine how everyday reproduction of power can affect capacities of human actors. It can provide a useful lens to study contestation of the subjectivity at an individual level, "but this alone will not result in empowerment and transformation of people's social relations of subjection within the dominant discourse" (Markula, 2003, p. 96).

He fails to provide a theory of power that looks at large scale transformations of power relations in society. Despite his sympathy with those over whom power is exercised, he focuses on individual resistance and destabilisation of power relations (Ashton-Schaeffer et al., 2001). He leaves the actual domination of larger structures intact and adopts a position that reinforces, relations of domination in our society, by insisting that that the marginalised communities of the society will continue to remain marginalised (Markula, 2003). His notion of local resistance centres around the argument that, "as contextual and historical beings, launching local resistant efforts against specific regimes is more appropriate and more effective than trying to formulate universal theories to justify acts of resistance" (p. 97). Therefore, while Foucault limits resistance at the individual level, he also alerts us to new broader possibilities for challenging and modifying power (Markula, 2003; Ashton-Shaeffer et al., 2001).

The Foucauldian concept of resistance also does not service the task of transforming the uneven power relations between the dominant and the powerless and vulnerable (Markula, 2003). Foucault maintains that in every relationship all parties have a certain amount of freedom to engage in an active care of the self. Hence there is always a possibility for transformation in an ethical use of power, but as certain power relations are more asymmetrical than others, the margin for change in those relations, is smaller (Markula, 2003; Foucault, 1988). For instance, Foucault (1988) gives an example stating that "in the traditional conjugal relation in the society, of the eighteenth and nineteenth centuries, we cannot say there was only male power, the woman herself could do a lot of things; be unfaithful to him, extract money from him, refuse him sexually. She was still however subject to the state of domination, in the measure where

all that was finally no more than a certain number of tricks which never bought about a reversal of the situation” (p. 12).

The asymmetrical nature of human power relations complicates the technologies of the self, because in such asymmetrical cases, instead of transforming the self and power relations, the human actor ends up merely ‘coping’ with the dominant discourses (Markula, 2003; Ashton-Shaeffer, 2001; Chapman, 1997). Technologies (techniques) of the self are standardised sets of means and rules established under the dominant rationality of a given social order, marked by its inherent power differentials (Kelly, 2013). In this capacity, technologies of the self, have potential to carry the dominant social and cultural rationality into the heart of self-constitution and thus ensure that the self is shaped in the image and interest of the dominant order. But at the same time, Foucault (1988) advocates that, the notion of techniques of the self, “presupposes conscious and deliberate usage on the part of practitioners, a process that opens space for agency, subversion, and alternative rationality. To the extent that if, individuals employ the prevailing technologies of the self imaginatively and reflexively, they will be able to take care of the self in a liberated fashion” (Foucault as cited in Chapman, 1997, p. 25).

Thus, in a way, technologies of the self, becomes a tool to analyse power relations and not to study individualisation (Markula, 2003). Through this lens researchers can study how the individual becomes a subject of power within the dominant discourse of the organisation while also having some individual capacity at the level of the ethical self. When it comes to linking Foucault with the technology artefact, Bloomfield (1995) stresses that in seeing reality as materially heterogeneous and relational, it becomes valuable to employ Foucault’s relational notion of power. This is because technology “increasingly mediates how power circulates, is exercised and what it produces” (p. 497).

For interpretive technology research to be critical, the practices which surround and involve information technology need to be analysed in the context of a wider set of social and political relations. Technology does not cause organisational changes so much as reflect them (Bloomfield, 1995; 1991). The construction and implementation of technology in a given context ‘assumes’ organisational change, rather than determining it. The attributes of a particular technology may open-up new choices and constrain others, while a dominant organisational culture may promote certain ways of working at the expense of others (Doolin, 2004; 1998). Hence the visibilities mobilised using technology may or may not lead to other changes. Technology does not directly impact organisations or society; “a change in social

relations, task, skills and knowledge is already prefigured in the way that the technology is conceived of and constructed” (Bloomfield, 1995, p. 497).

Bloomfield and McLean (1996) state that a critical overview towards technology, challenges the dominant and granted notions of the inherently progressive nature of technology and confronts the issues of power in technological and organisational change. It becomes important then to focus on the ensemble of practices, techniques and artefacts that make up an information technology, as implicated in the governance and subjectivity of organisational actors (Doolin, 1998). Human actors do have the tendency to resist and challenge the system of rules that subject power and control over them. Their actions are influenced through a mechanism of self-monitoring, rather than direct control and supervision. “That is, individuals are constituted as subjects capable of operating a regulated autonomy. What emerges is a regulated subjectivity, in which individuals are transformed into subjects who secure their sense of meaning, identity and reality through their participation in a range of disciplinary and discursive practices” (p. 302). These discourses and practices which they reproduce constitute the truth of what is normal in social and organisational relations. As Knights and Willmott (1989) note: “the very exercise of power relies upon the constitution of subjects who are tied by the sense of their identity to the reproduction of power relations” (p. 537).

Increasingly, technology mediates this process of reproduction of power relations thereby being implicated in the dominant discourse of an organisation/institution. Power then works in a disciplinary manner by internalising the social and institutional norms and the construction of a particular reality by the human actors of that institution. It plays an important role in mobilising these values and norms through which individuals derive meaning and identity (Bloomfield, 1995; Orlikowski & Robey, 1991). In doing so, “they underpin the framework of meaning within which organisational participants regulate their own behaviour in accordance with the norms and values associated with these knowledges and discourses” (Doolin, 1998, p. 306). This invokes the notion of an electronic panopticon, in which human actors are constantly subject to a stronger form of control, surveillance and accountability towards the adherence of the dominating rules and norms. The implication is that implementation and use of technology can be used to facilitate a more embedded and repressive means of control in organisations. Information technology is more likely to reinforce hierarchical power than undermine it (Knights & Murray, 1994; Orlikowski & Robey, 1991).

Previous research has acknowledged that technology can serve as a conduit of domination and control over human actors in everyday organisational/institutional practices (Bakardjieva & Gaden, 2012). I extend this existing understanding of power by using the Foucauldian lens of technologies of the self to unearth how human actors become subjects of power through everyday technology use and secondly, what role does technology play in mediating the subjectivities of human actors – does it only reinforce existing power relations, or does it also create spaces of change for individuals?

While the main concept is technologies of the self, it will be grounded in Foucault's (1982) analytics of relational power. As noted in the discussion of Foucault's (1996, 1988, 1982a, 1982b) texts, the technologies of the self, always contained the element of power, where the construction of the social role and ethical self of the human actor is done within social practices that sustain power relations and processes. The nature and form of the power present in technologies of the self, depend on the way in which these technologies coalesce with society's technologies of power/domination. Technologies of the self also extends the Foucauldian lens from existing IS and ICT4D research and brings a new dimension to confronting power issues surrounding technology use (Bakardjieva & Gaden, 2012; Willcocks, 2004). It focuses on the power processes that come into play at an individual level when human actors interact with technology in a particular context. Thus, in this research I do not focus on the large-scale transformation of power relations but focus on the individual level analytics of power (Markula, 2003). The perspective of technologies of the self helps better explicate these individual level subjectivities within the larger reproduction of power, thereby highlighting the subtleties of power processes surrounding technology use. Further, such an understanding of power as mediated by technology can aid in understanding the dual i.e., empowering, and disempowering effect of technology on human actors.

2.2 Structure

This section addresses my perspective on the aspect of structure as adopted in this thesis. I start by explaining Giddens's structuration theory and its constructs. This is followed by highlighting the key debates and adoptions of structuration theory within the IS and ICT4D literature along with its criticism. This helps carve out the motivation for the adopting and advancing structuration theory within technology research, which is followed by highlighting

the social positioning concept. The concept of social positioning is the key structuration concept that I implement in this thesis to analyse the relationship between technology and structure and its impact on human actors.

2.2.1 Giddens's Theory of Structuration

The ontological oppositions within social theory stemming from centuries on how to understand social phenomenon can be broadly classified in two categories i.e., subjective and objective (Sewell, 1992; Orlikowski & Robey, 1991). The subjective lens sees social systems being formed through meaningful human behaviour and the importance of the subjective human experience in the interpretation, creation, and modification of the social world. This is further supported by hermeneutics and phenomenology that focus on the knowledgeability of the human agent to recreate and create their social world through deliberate action and enactment (Bernstein 1983; Weick, 1979). Contrarily the objective lens focuses on the institutional aspects of social systems which are seen to be independent of and constraining human action, hence portraying social reality as objective. This is supported by structuralists and functionalists that focus on structural forces that shapes social behaviour (Archer, 1995; Bhaskar, 1979). This confrontation appears to rest upon the premise that the two positions are mutually exclusive (Orlikowski & Robey, 1991). In Giddens's account at least, these two traditions are incompatible with each other until the advent of his theory, which centres the focus on the mutuality of individual actions and societal structures, where the starting point is neither the subjective individual action nor an objective structure imposing on human action, but *social practices* (Giddens, 1984, p. 2). It is social practices which lie at the root of the constitution of both individuals and society. "All social life is generated in and through social praxis; where social praxis is defined to include the nature, conditions, and consequences of historically and spatio-temporally situated activities and interactions produced through the agency of social actors" (Giddens, 1989, p. 2). The basis of this social theory is to be able to explain how social processes operate in any given context.

Giddens (1984) focuses on the mutually interacting duality, where people draw on structures for their actions but, in doing so, they also produce and reproduce these structures. In other words, human actors build, use, and reproduce social structures through their actions, but these actions are enabled and constrained by the structures. Structuration theory, then, is concerned with the way in which social practices both contribute to the production and reproduction of

social structures and how these practices are themselves shaped by those structures; they are two sides of the same coin (Giddens, 1984; 1979). It is in this way that structures can be seen to be ‘both the medium and the outcome of interaction’. Structure, from this perspective, is not something concrete and it lacks material characteristics. Structure has only virtual existence and cannot exist apart from the human actors who enact and interpret its dimensions. It exists only in the ‘memory traces of human agents as rules and resources instantiated in action’ (Giddens, 1984; Orlikowski, 1992).

Structure conditions social practices by providing the contextual rules and resources that allow human actors to make sense of their own acts and those of other people. But individuals do not enact structures in a vacuum; they call on the structural properties that were enacted in the past by prior human action (their own or that of others). In this way, the structural properties established by prior human action come to define and shape individuals' interaction, which in turn recreates the structural properties anew. Conceiving of structure in this way acknowledges both its subjective and objective features (Rose & Lewis, 2001; 1998, Scapens & Macintosh, 1996; Baber, 1991). Structure does not merely emerge out of subjective human action; it is also objective because it provides the conditions for human action to occur. Structure thereby provides the means for its own sustenance, and structure and action constitute each other recursively. Structuration theory allows elimination of the artificial partitioning of research attention between macro and micro levels of analysis, because the process of structuration operates at multiple levels of analysis: individual, group, and social system (Sewell, 1992; Orlikowski & Robey, 1991).

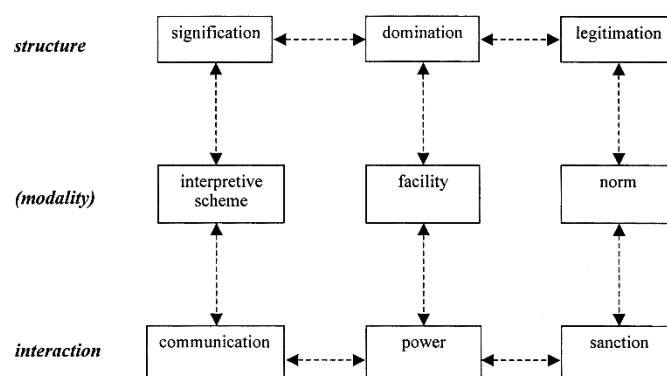
Giddens (1979, pp. 82-93) further specifies the three ‘modalities’ that link that structures of meaning, power, and moral frameworks within which human interaction is composed.

Interpretive schemes – All human interaction involves meaningful communication and is achieved through interpretive schemes. The process of human interaction, according to Giddens, is the core of all sharing and formation of mutual knowledge and meaning that human agents gain. They are the stocks of knowledge that human agents draw from in the production and reproduction of interaction. These schemes, from an institutional point of view comprise of structures of *signification* that represent social rules and norms that enable, inform, and constrain the communicative process. Therefore, in any human interaction, the sharing and formation of knowledge is not merely a background of social life but an integral nexus where

human *communication* is not only organised and delivered but is constantly shaped and reproduced as well (pp. 82-83).

Resources – This is where *power* enters the realm of social life. Power provides capabilities to human agents to accomplish outcomes. Giddens understands power as the “transformative capacity”. It is mediated via both allocative (utilitarian and economic capacity) and authoritative (to control and coordination) resources that human agents mobilise within interaction. While these resources comprise of the medium through which power is exercised, they also form the elements of the institutional structures of *domination*. The use and debilitation of resources is what reaffirms the aspect of domination and power within institutions and organisations. Therefore, an asymmetry of resources can form that point where structures of domination can be challenged, countered, or modified (pp. 84-86).

Norms – Norms are organisational/institutional/societal rules or conventions governing legitimate conduct of a human agent. These codes of appropriate conduct are created out of continuous use of *sanctions* or regulations. "Normative components of interaction always centre upon relations between the rights and obligations expected of those participating in a range of interaction contexts" (Giddens 1984, p. 30). Therefore, institutional structures of *legitimation* are rooted in norms. Norms reinforce the normative order through tradition, rituals, and practices of socialisation (Giddens, 1984, p. 30).



Source: Adapted from Giddens (1984) p. 29

Figure (2) Structures of domination, legitimation, and signification

Therefore, as explained in figure (2) all institutional/societal human interaction and relations are rooted within the intersection of structures of domination, signification, and legitimation.

While these structures are not visible to the human eye and exist virtually in the minds of the human agents they are nonetheless enacted by human agents and instantiated in social practices thereby making them 'real', as real as, "for example, the syntax of a language which has no written form, which is not codified, and which therefore must be 'in the speakers' heads'-fit is anywhere" (Sewell, 1992, p. 4). These three modalities determine how the institutional properties of social systems mediate deliberate human action and how human action constitutes social structure. The linkage between the realms of social structure and human action is referred to as the 'process of structuration' (Giddens, 1979).

Giddens also underlines the importance of routinization in the reproduction of structures, compared to the agency (human action) required to change these structures. "The concept of social institutions in structuration theory specifically refers to routinized practices that are carried out or recognised by the majority of members of a collectivity" (Giddens, 1989, p. 38-39). Social institutions then are constituted of 'knowledgeable' human agents (i.e., people who know what they are doing and how to do it), act by putting into practice their necessarily structured knowledge. Agents do have the potential to enact their structurally formed capacities to work in creative or innovative ways and 'can act otherwise', especially if it is a collective of individuals. Human beings, as implied by traditional views of structure, are not "cultural or structural dupes" dictated by objective structures but are in a constant state of reflexive monitoring of their situation (Giddens, 1979, p. 52). Knowledgeable human agents are aware not only of the rules attaching to their social positions they themselves occupy (man, woman, minister, teacher, catholic), but also of those attaching to related positions. Social reproduction occurs through situated actors' responses to the sets of options offered at any moment (Macintosh and Scapens, 1996). Giddens makes the crucial distinction between *practical* and *discursive consciousness* and proposes that practices can be performed without the human agents always being aware of it. Indeed, he claims that most day-to-day conduct occurs in this manner (Giddens, 1984, p. 6). The reinforcement or transformation of structural properties by humans is often unacknowledged and unintentional. Practical consciousness refers to the tacitly understood procedures which agents reproduce at different times and in different settings, and which exist deep within their memory traces as familiar features of social *praxis*. "Most such knowledge is practical in character: it is inherent in the capability to 'go on' within the routines of social life" (p. 4). Even when actors are (discursively) conscious of constraints and aware of potential changes, transformation in social practices does not take place that easily: "The notion that social actors are—or become—knowledgeable does not completely address the fact that

many actors, even though knowledgeable, fail to change the structural conditions that determine or oppress them, and as a result, simply go on to reproduce these very conditions” (Giddens & Pierson, 1998, p. 80). Merely being capable of changing structural properties does not imply that those capabilities will be exercised, and while human actors always have some capacity for independent action, there are no guarantees that such resources will be drawn on. While Giddens focuses predominantly on the instantiation of structure in “what people actually do” (Giddens & Pierson 1998, p. 81), he also recognises that their actions take place within a context that “places limits upon the range of options open to them” (Giddens 1984, p. 177) and that may have an objective existence. Stones (1998) suggests that, for Giddens, structuration involves both virtual *internal* and objective *external* structures, but social action is always mediated through the former.

2.2.2 IS and Structuration Theory

The meta-theory developed by Giddens has been extensively used to consider the role of IT within organisational research. Scholars in the IS field have used Giddens’s (1984, 1979) structuration theory mainly to understand the evolvement of the user’s interactions with technology, its consequent organisational implications, and unintended consequences (Jones & Karsten, 2008; Chu & Smithson, 2007; Pozzebon & Pinsonneault, 2005; Brooks, 1997; Barley, 1986;). Researchers have also used structuration theory to understand processes of stability and change in social practices in relation to technology in cross-cultural global/local settings (Bernardi et al., 2019; Bernardi, 2018; Schultze & Orlikowski, 2004; Sarker & Sahay, 2003; Walsham, 2002). A sub stream of this research has also sought to illustrate the application of certain elements of structuration theory as a duality of power (Hussain & Cornelius, 2009) and space-time analysis (Nandhakumar & Jones, 2001).

One of the early extensions of the structuration theory in the IS field was the Adaptive Structuration theory, AST (DeSanctis & Poole 1994; Nagasandrum & Bostrom 1994 in an associated effort). AST was developed in response to the perceived weaknesses of previous structuration approaches, which were seen as giving a weak consideration to technology, being exclusively focused on the institutional level, and relying on purely interpretive methods (DeSanctis & Poole, 1994). Among its key propositions are that “social structures serve as templates for planning and accomplishing tasks and that designers incorporate some of these structures into the technology, thereby reproducing or modifying them, thus creating new

structures within the technology” (DeSanctis & Poole, 1994, p. 125). Here Giddens was integrated with the decision-making school of theoretical thinking to provide an analytical framework which provides insight, particularly into the group decision support systems (GDSS) which was the focus of their empirical work. However, the AST approach comes in for sustained attack from several IS researchers (Jones & Karsten, 2008; Lyytinen & King, 2004; Pozzebon & Pinsonneault, 2001; Jones, 1999; Banks & Riley 1993) who have noted that AST diverges significantly from Giddens’s position in quite a few areas. Specifically, AST’s view of structure within technology, its identification of other independent sources of structure, and its concept of a dialectic of control between the group and the technology would seem inconsistent with Giddens’s position that structure is virtual, existing only in its instantiation; that it does not have independent sources, but is the indivisible medium and outcome of the reproduction of practices. The extra concepts, such as spirit and appropriation, employed by AST would also appear to reify what for Giddens are purely analytical constructs (Jones et al., 2004).

Jones (1999) then developed four types of use of the theory: attempt to reconstruct the theory to accommodate technology, application of the theory as an analytical tool, use of the theory as meta-theory, and use of concepts from structuration theory to inform IS research. Walsham (2002; 1993) proposed using the theory to understand how context and culture influences process. In Walsham’s proposed model, context assumes the role of structures, and IS the role of actions. He adopts the modalities, interpretive schemes, facilities, and norms of the structuration theory to conceptualise the linkage between the IS context and processes. However, he recognises the limitations of the theory by stating that the duality of structure and the associated modalities could be considered as too detailed and complex for empirical analysis in some instances. Indeed, any researcher of IS interested in applying this theory would have to deal with the lack of link between theory and data.

To move beyond several of the false dichotomies (subjective vs objective, socially constructed vs material, macro vs micro, and qualitative vs quantitative), Orlikowski (1992) and Orlikowski and Robey (1991) reconstruct the concept of technology from a structuration point of view. They move from the one-sided deterministic lens of technology to technology being viewed as a *medium of human action*. They state that technology is both a product of human action and reified in structural properties of the organisation/institution (i.e., structures of signification, legitimation and domination and different levels of knowledge and power affecting actors). That is, “technology is physically constructed by actors working in a given social context, and

technology is also socially constructed by actors through the different meanings they attach to it and the various features they emphasise and use” (Orlikowski & Robey, 1991, p. 152). However, it also the case that technology does become reified and institutionalised once it is developed and implemented thereby also losing its connection with the designers who constructed it with an intention. Hence, technology then ‘appears’ to be objective to the users. But, building on the notion of interpretive flexibility, they state that even once technology is institutionalised, its use and interpretation in practice can be mediated through human action (p. 154). There is a constant dialectical interplay going on between knowledgeable human action (agency) and structural forces of institutionalised practices (structure). Thus, technology can only condition, and never determine social practices and can both constrain and enable human action. Technology-as-a-medium-of-social-practices necessarily has both restricting and enabling implications. Which implication dominates, depends on multiple factors including the actions and motives of designers and implementors, the institutional context in which technology is embedded, and the autonomy and capability of users in that context (Orlikowski, 1992).

Orlikowski (2000) further modifies this structurational model of technology into the practice lens. She contrasts the practice lens from the AST’s view of technology’s appropriation analysis which sees technology as embodying structures which are invoked for use in a specific context. She instead states that while a technology can be seen to embody certain symbol and material properties, it does not embody structures because those are only instantiated in practice. Instead, structures (rules, resources, norms) are virtual and emerging from people's repeated and situated interaction with technologies in use (2000, p. 405). When humans interact regularly with a technology, they engage “with (some or all of) the material and symbol properties of the technology” (p. 408). Through such repeated interaction, certain of the technology's properties become implicated in an ongoing process of structuration. Thus, structures of technology use are constituted recursively as humans regularly interact with certain properties of a technology and thus shape the set of rules and resources that serve to shape their interaction. Thus, the practice lens of technology starts not with how technology is appropriated by users, but with how human action enacts emergent structures of technology through the situated and recurrent interaction with the technology at hand (2000, p. 408).

The practice lens was pivotal in changing the view of technology from being embedded, embodied, deterministic but instead as medium of and for human action which helps organisational researchers better understand the intended and unintended consequences of

technology. Shifting the attention on how technology structures are constituted and reconstituted in recurrent social practices acknowledges that while users can and do use technologies as they were designed, they also can and do circumvent inscribed ways of using the technologies-either ignoring certain properties of the technology, working around them, or inventing new ones that may go beyond or even contradict designers' expectations and inscriptions (Orlikowski, 2000). As the duality of technology and practice lens lends itself to understanding human action in technology use, it also then, makes it applicable to study by ethnographic and qualitative fieldwork. To be cognizant of the role, of the impact and perception of historical and contextual factors on human action and its consequent impact on how human actors use and perceive technologies in practice, a qualitative lens helps delve into a deeper level of granularity of understanding human action. The implication is that a qualitative research methodology (with or without quantitative methodology) within an emergent research strategy, such as provided by a contextualised and longitudinal program of investigation better encompasses the nuances of human action and perception of technology use (Jones & Karsten, 2008; Orlikowski, 2000).

Several researchers within IS have adopted the structuration lens by directly applying Giddens's tenets or by using Orlikowski's duality of technology lens. Nandhakumar and Jones (2001) drew on Giddens's analysis of time to explore the temporal and spatial organisation of information systems development work practices, arguing that this provides a better understanding of the social dynamics of time management than is provided by traditional project management approaches. Similarly, Karsten (2003) presents Giddens's concepts of social and system integration as a useful way of exploring the joint management of work in a dispersed group. Smithson and Chu's (2007) study revealed how organisational structures of domination, legitimation and signification posited structural contradictions and unintended consequences, ultimately derailing the e-business implementation process. Hussain and Cornelius (2009) highlighted in their research how the success of an IS implementation in a community health care was shaped, by the senior stakeholders of the organisation through the production and reproduction of structures of domination and legitimation. Thompson (2012) delves into the concept of self-positioning and identity to further theorise the aspect of subjectivity and the notion of the individual self when seeking to understand the relationship between technology and human agents. More recently, Bernardi (2018) in her study of HIS influence on accountability practices in Kenya uses the structurational lens to integrate the materiality of technology. She looks at how the material features of a technology act as the

boundaries in which users can interpret a technology while they draw on the social structures of their institutional environment. She integrates the lacking aspect of materiality within the theory of structuration and sees how the materiality influences processes of structuration by shaping the meanings that users associate with a technology and users' intended use of a technology.

Critique

The structuration framework however is not without its limitations (Jones & Karsten, 2008). A major concern is its methodological application and its difficulty in empirically applying the ideas in real world social practices (Pozzebon & Pinsonneault, 2005; Walsham, 2002; Monteiro & Hanseth, 1996; Layder, 1987; Callinicos, 1985). In particular, the theory provides a meta-theory—a way of thinking about the world—rather than a middle range theory about specific phenomena that can be explored or tested directly and empirically. Giddens's (1989) response is that structuration theory, whilst not carrying specific methodological implications, 'sensitizes' the researcher to particular sets of concepts (such as the relationship between action and structure) which might otherwise have been ignored. Hence to use this as sensitizing device only, when analysing social phenomenon. A field often dominated by technical considerations; any informed account of social practices helps to redress the balance. A further answer is that richer understandings of social processes obtained by theorising and analysis may pass into the store of 'mutual knowledge' that informs IS practice (Rose & Lewis 2001; Rose, 1998).

Giddens's lack on the take on technology poses a further problem for the IS researcher. The 'lack of specificity' about the technical details of information systems (Monteiro & Hanseth, 1996) means that the researcher may investigate the social actions around the technology or offer broad brush theorising in the style of Orlikowski (1992, 1991), or start borrowing or inventing theoretical concepts to fill the vacuum in the manner of Poole and DeSanctis (1994). However, that Giddens does not deny the existence of a material world that affects how people act. As he puts it in Giddens and Pierson (1998, p. 82), "you can't just walk straight through a wall." Rather Giddens is seeking to distinguish between how the physical world affects action and how social structure influences social practice (Rose et al., 2005; Rose & Lewis, 2001; Rose 1998). In the latter case, he argues, the "causal effects of structural properties of human institutions are there simply because they are produced and reproduced in everyday actions" (Giddens & Pierson 1998, p. 82). It is not, therefore, that technology can have no influence on

social practice, but that whatever effects it has depend on how human actors engage with it in their social practices.

Another criticism of Giddens's position within IS research is that the effects of material artefacts on social practices are wholly dependent on the knowledgeability of human actors (agency) thereby ignoring the aspect of materiality of technology (Bernardi 2018; Jones & Karsten, 2008; Rose et al., 2005). The assumption then is that if actors are not knowledgeable about the functional use and effects of technology then the unintended consequences of technology cannot be explained with a possibility of technology's independent influence (enabling and constraining) on human actor's practices. This aspect has also shed criticism on Orlikowski's (2000, 1992) structurational concepts. In her studies, limited attention has been paid to the materiality of technology and the broader institutional influences. Additionally, her studies have been conducted within organisations and the focus has been on the micro-level interactions of actors within specific institutional settings. This largely ignored the broader institutional influences—industrial, economic, political, global—that shape IS phenomena. There is a call for a stronger linkage between the individual micro-level action and macro-level institutional processes (Jones & Karsten, 2008).

Viewing agency (or human action) as the 'capacity to make a difference' and arguing that, apart from in quite exceptional circumstances, social actors always have the possibility to do otherwise, Giddens (1979) suggests that structure is never a binding constraint on action, but simply places "limits upon the feasible range of options open to an actor in a given circumstance" (Giddens, 1979, p. 177). For Giddens's critics (Archer, 1990; Layder, 1987; Callinicos, 1985) this is problematic on at least two grounds. First, while defining agency as a capability for action may be necessary from a structurational perspective, but it does not mean that all agential effects are the products of activity. For example, Harré (1983) suggests that in well-ordered institutions, such as monasteries, social rules may dominate social reproduction and that individual structurational agency is thus insignificant or even absent. But the ability for a monk to leave the monastery whenever he wishes, could be still accounted as having some agency. Secondly, it is argued that structures may restrict agents' choices far more than Giddens suggests. Pozzebon and Pinsonneault (2005) argue that within empirical IS research a structuration perspective can sometimes fail to explain the impact of the deterministic external socio-institutional environment on human agents and its consequent impact on their interaction with technology. Sometimes under certain circumstances, opportunities, and power dynamics, for people to 'do otherwise' and escape from strong constraints imposed by structural

properties are too small, sometimes virtually nil (Giddens & Pierson, 1998). Similarly, Layder (1985) and Brabalet (1987) suggest that “the *durée* of the material, although not imposing absolute constraints on system change, does mean that at any moment not everything is possible” (p. 16). For example, the potential for video-on-demand services is likely to be significantly constrained by the available bandwidth. Archer (1990), for example, proposes that individuals, such as a landless peasant at the start of the capitalist era, effectively had only one feasible option if they wished to survive, to sell their labour power.

However, New (1994) argues to Archer’s criticism and states that while a landless peasant has ‘no choice’ other than to sell her or his labour power to the owners of capital. Giddens argues that even this asymmetrical relationship is enabling by providing her employment, the worker does have a way of earning her living even if her actions are constrained. Most constraints are not experienced as such most of the time, Giddens argues; “for power relations are usually embedded in the routines that characterise most of our daily behaviour” (Giddens, 1984, p. 176). Constraints are sometimes of an “implacable character” (Rose, 1998, p. 12). Giddens is simply making the important philosophical point that social constraints cannot abolish agency (indeed, they presuppose it), and “immanent possibilities of change flow from the fact that this is so” (Rose, 1998, p. 3).

Other supporters (Zheng, 2015; Jones & Karsetn, 2008; Walsham, 2002; Orlikowski, 2000) of Giddens’s argue that the social context is what influences individuals' perceptions, knowledge, experiences, understandings, choices, priorities, and actions of human agents. Hence any perception and use of technology, then, even in a restrictive structural environment is amenable to use only through human action. Technology cannot be put into practice without human action. As Orlikowski (2000) states “users draw on their knowledge of and experiences within the institutional contexts in which they live and work, and the social and cultural conventions associated with participating in such contexts” (p. 420). In this way, people's use of technology becomes structured by these experiences, knowledge, meanings, habits, power relations and norms. The focus on human agents, their social relations and interactions then helps IS researchers be more *sensitive* to actor’s roles in sustaining and modifying settings, especially those that are rigid (Jones & Karsten, 2008; Rose & Lewis, 2001). The intrinsic interconnection between social actors and social institutions suggests that researchers need to pay equal attention to how individuals contribute to organisational and social power relationships, norms, and meanings, and how individual practices are shaped by these. Rather than privileging structure or agency, IS research should magnify the delicate interconnections between social

actors and social institutions and its impact on technology use (Jones & Karsten, 2008; Silva, 2007). Thompson (2012) further enforces this by stating IS research should also focus on the non-cognitive emergent structures of technology in practice. This can be achieved by integrating other theories with the structuration theory to give more interdisciplinary evidence to studying the impact of technology on other subjective and emotional dimensions of human actors. A fuller appreciation of Giddens's structuration ideas would also suggest that there may be opportunities in addressing other aspects of Giddens's work that appear to have been under-explored in the IS field. Aspects such as social positioning of human agents or resistance to change or an investigation of unacknowledged conditions and unintended consequences of technology would give a more holistic understanding of Giddens's theory (Jones & Karsten, 2008).

2.2.3 ICT4D and Structuration theory

I now depart to the application of structuration theory within the ICT4D context. As structuration theory first entered the realm of technology research through the IS domain, it was important to highlight and understand extant critique and application of structuration theory in IS. Over the years, structuration theory from IS has also moved to the ICT4D domain. I will now be highlighting how structuration theory forms an important theoretical lens within ICT4D research.

Structuration theory within the domain of ICT4D has been used as a metatheory to deconstruct the complexity of technology implementations and use, in the developing country context. Prasad (2009) in his research on organisational performance in developing countries develops a methodology that uses the structuration lens to better explicate the contextual factors that leverage IT resources in organisations. Andersson and Hatakka (2010) in their study of distance education and technology in Bangladesh and Sri Lanka, discovered how the human actor's beliefs and mindsets played a crucial role in the formation of emergent structures of technology in use and its consequent impact. De and Ratan (2009) depart from the dominant rhetoric in the ICT4D that views ICT enabled processes as apolitical and being inherently efficiency enhancing. They perform a comparative study of two microfinance ICT implementations in India, to highlight how contextual and political issues are pertinent for the effective implementation of technology within developing countries. They suggest focusing on the aspect of human agency in order to ensure that for a successful IS implementation there is

alignment in understanding the end user's constraints and the goal of the external agent. Pscheidt (2011) in his study of cross-cultural software production in Mozambique was able to highlight how cultural differences and similarities led to the production and reproduction of agent reflexivity which led to the successful implementation of the IS. Kemal (2018) through her Pakistan study, elucidated how women beneficiaries in their enactment of technology (in the form of mBanking) felt simultaneously empowered and disempowered. The duality of technology on the one hand enabled freedoms of women by receiving full payments without the obstructions of the middleman and being able to leave home. On the other hand, it also constrained women to leave their homes to collect the payments alone, and instead they had to leave in groups thereby creating the organisation of groups and networks around technology use.

Early research within the ICT4D domain centred around the appropriation of technology from the western practices into the non-western milieu (Sein et al., 2019; Bhowmick, 2015). This often led to technology failure or glaring unanticipated outcomes of technology due to the severe misalignment between the user's constraints, as shaped by their localised settings and the technical rationality adhered by the external implementor of technology (Bhowmick, 2015; De and Ratan, 2009). Structuration theory then was largely adopted by IS researchers to understand how the local contextual processes impacted technology use in a way that led to the socio-economic development of communities (Zheng, 2015; Walsham, 2002; 1999).

For instance, a rural farmer in a less-developed community acts in his own social structure, that is by the rules and resources that have been the environment of his daily life and that forms his social structure woven into what Giddens (1979, 1984) calls the 'longue durée' of institutional time. The agent operates in keeping up with memory traces of historically long association with this social structure such as land ownership, crop ownership, local pricing mechanisms, agricultural laws, local power networks etc., thereby reproducing these rules and norms tacitly and discursively. The introduction of technology then, in such an institutional setup, can either be a medium for transformative capacity for the farmer (e.g., bypassing middlemen for crop selling, getting easy access to crop prices) or be a medium where technology further reinforces the existing rules and norms (e.g., stricter check on pricing mechanisms, introduction of new middleman to maintain digital land records for farmers). When a human agent acts along the established rules he reproduces the structure, however when an agent circumvents around or resists against the rules then he causes change. Thus, the same applies to their interaction with technology (Bhowmick, 2015).

Both technological objects and human actors do not exist in vacuum but are present in a context which is supported by various structures. All human agents are positioned structurally with respect to another in a social system, be it culturally, socially, economically, or institutionally. It is these supportive structures that firstly, constitute all social practices and form basis of all social relations and secondly, also condition how technology is perceived and used within social practices. Therefore, the social position or role that a human actor enacts becomes that point where the human actor meets the social structure that shapes his/her role in society and consequently, also his/her interaction with technology.

2.2.4 Social Positioning

In structuration theory, social systems are characterised as regularised practices and routines that are sustained in encounters dispersed across time-space. Social actors are then ‘positioned’ within a network of social relations and their consequent conduct and interaction is what constitutes practices (Busco, 2009). Giddens’s notion of social position is defined as “a social identity that carries with it a certain range (however diffusely specified) of prerogatives and obligations that an actor who is accorded that identity (or is an ‘incumbent’ of that position) may activate or carry out: these prerogatives and obligations constitute the role-prescriptions associated with that position” (Giddens, 1979, p. 117).

Giddens (1979) associates these ‘social positions’ with the notion of a social role that human actors enact in society. Thus, by emphasising the purposiveness of agents (which are knowledgeably reflexive) and the contextualities of interaction, he stresses the importance of social positions for the enactment of conduct that occurs in structured practices. The point of contact between the rules, norms, resources and individuals — the link between social structure and agency — is to be found in positioned practices; that is, “positions (places, functions, rules, tasks, duties, rights, etc.) occupied (filled, assumed, enacted, etc.) by individuals, and of the practices (activities, etc.) in which, in virtue of their occupancy of these positions (and vice versa), they engage” (Smith & Seward, 2009, p. 3).

The aspect of ‘positioning’ forms the empirical fulcrum for pivoting between agency/human action and structure (Busco, 2009). Within the process of structuration these ‘positions’ are structurally produced and enacted at the intersections of *signification*, *domination*, and

legitimation in the duality of structure (Giddens, 1984). These three analytical dimensions of structure correspond to the social interactions of *communication*, *power*, and *sanctions*.

Furthermore, pointing out that ‘social systems only exist in and through the continuity of social practices’, he argues that their structural properties are best characterised as “position-practice” relations (Giddens, 1984, p. 83). These position-practices are individuated within frames of rules and norms that constitute and regulate these activities. They provide “the ordering of activities and meanings whereby ontological security is sustained in the enactment of daily routines” (1984, p. 86). Being at the centre of the process of structuration, ‘positions-practices’ are viewed as spaces informed by the knowledgeable human activity, in which specific skills and competence acquire the same importance as the obligations and the rights they contribute to establish. In so doing, they involve not only a positional identity (position), i.e., functions, tasks, duties, rights, etc., but also a set of routinised patterns of behaviour (practices), i.e., activities, which incumbents perform using the abilities and skills they possess thereby institutionalising practices (Cohen, 1989).

Therefore, from a technology perspective, the source of reproduction and production of the Giddensian structure is based not on the interaction between artefacts and human actors but on the social and institutional interaction that human actors have with each other as situated in institutionalised power relations and positions. This interaction then forms the context which conditions the technology artefact’s perception and use by human actors (Bhowmick, 2015). Within this interaction, human actors can either use their knowledgeability and circumvent around or resist technology use or further reinforce the structures governing technology use. In that sense, change within existing social practices first occurs at an individual micro-level which then through continued agentic action over time, and in cohesion with other human actors, produces and reproduces a modified social practice as a new structure (Giddens, 1984). This may relate to the *long durée* that seems to be needed for the adoption of change to new technologies especially when transferred from the west’s idea of development to the developing regions of the world.

In theorising the relationship between structure and technology within the ICT4D context, it is important to keep in mind, that technology implementation and use, will interact with existing structures of signification, domination and legitimation that hold human actors in varying social positions of power, and in relation to one another. In that sense, it becomes important to unravel how institutionalised social positions impact the way technology is perceived and used, or in

other words how does the social positioning of human actors condition the outcome of technology?

I initiate a call for a renewed interest in the structuration theory by exploring one of the under-explored, but equally important tenets of the theory namely, the concept of social positioning. By adopting a social positioning lens, I move beyond Orlikowski's (2000) practice lens and move the focus from the centrality of human agency, as studied in extant IS and ICT4D structure research to the relative *social positioning* of human actors within institutionalised practices. By addressing the occupancy of positions as institutionalised in practices, the overarching structures of domination, signification and legitimation also get highlighted (Zheng, 2015; Bhowmick, 2015; Walsham, 2002). From an empowerment perspective, magnifying the lens on the interaction between technology and the human actor as enveloped structural relations can help us understand the impact of structure in conditioning processes and outcomes of digital empowerment.

2.3. Affordances

In this section I present my theory of technology which is the socialised affordances theory of technology. The section begins with briefly explaining the origin of affordances from the field of ecological psychology and its link with technology research. This is followed by the existing debates and gaps in the functional affordances' literature of IS that carves out the need for adopting a socialised affordance lens. This next part highlights the importance of delineating action potentials from outcomes of technology as discussed within existing affordance actualisation research. The final section discusses the debates around the ontology of the affordance concept within the IS literature and how a socialised affordance lens can aid in advancing interpretive technology research.

2.3.1 Technology and Affordances

The term 'affordance' was coined by Gibson (1979) an ecological psychologist and was based on Gestalt principles. Gibson stated that the affordances are not simply phenomenal qualities of the subjective experience; instead, they are ecological, in the sense they are properties of the

environment relative to an animal. In other words, animals and people perceive, not the properties of objects, but rather the “affordances” of objects, defined as “the acts or behaviours that are afforded or permitted by an object, place, or event” (Michaels & Carello, 1981, p. 17). “We would say that humans do not perceive chairs, pencils, and doughnuts; they perceive places to sit, objects with which to write, and things to eat” (p. 42). In this view, the real properties of objects are necessary conditions for affordances, not the affordances themselves (Heft, 2003). Affordances exist independently of the organism and afford direct perception with the help of the environment and the properties of the object, that provide the organism the information that uniquely specifies the affordance. Gibson (1979) specifies that, an affordance casts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behaviour. It is both physical and psychical, yet neither. An affordance points both ways, to the environment, and to the observer (p. 129). Gibson’s conception provides two perspectives, one from the organism towards the environment and one from the environment towards the organism and is an example of a duality (dual perspectives).

Turvey (1992) asserted that affordances are chiefly dispositional properties of the environment, paired with and relative to actors, who have the capability to actualise those affordances. This was contrasted by Stoffregen (2003) who adopted a relational interpretation and instead proposed that affordances are properties of the animal–environment system that is, that they are emergent properties that do not inhere in either the environment or the animal. Chemero (2003) furthered this and asserted that affordances emerge from relations between the abilities of animals and the features of the environment. Chemero and Turvey (2007) then jointly stated that they oppose who define affordances as mental representations and agree that affordances are emergent, relational properties of the environment. Hence, affordances are not static properties, but dynamic relational attributes that arise between the organism and environment. This debate between the dispositional and relational interpretations of affordances has been replicated in other fields where the notion of affordances has been used; thus, suggesting that an integrative perspective on affordances is both necessary and difficult to conceptualise (Shaw et al., 2019).

Within technology research Norman (1988, 1999) is primarily responsible for bringing in and popularizing the affordance perspective within the HCI community. While for Gibson the focus of an affordance is an act of behaviour or action possibility itself, for Norman the focus was more on the aspect of clearly conveying the action possibilities furnished by technology to the

human actor. To manipulate the design of the technology in such a way so that the exact utility of technology could be easily perceived and enacted by its user. His perspective was deeply ingrained in the affordance-is-in-the-object view and emphasised on perceived affordances. That a good technology design conceals the complexity and makes its users effortlessly perceive the intended usability of the technology. This has also gained increasing attention in other fields of design research such as engineering design, library system design, and personal technological products design (Maier & Fadel, 2008; Sadler & Given, 2007; Tang et al., 2011; Zhang, 2008).

Gaver (1996) in his work in the social-is-material for design emphasised on the material influences on social behaviour. While being close in his view to Norman, he suggested that social meanings are based on facts of the physical world. He emphasises on unearthing both the limiting and capabilities that technologies offer while centring his take on affordances as independent of perception. He emphasises on affordances being afforded as explicitly part of the design and divides the affordances into four categories *Perceptible affordances*, in which there is perceptual information available for an existing affordance. *Hidden affordances*, if there is no information available for an existing affordance, it is hidden and must be inferred from other evidence. *False affordances*, if information suggests a non-existent affordance, a false affordance exists upon which people may mistakenly try to act. *Correct rejection*, people will usually not think of a given action when there is no affordance for it or any perceptual information suggesting it (Gaver, 1991).

However, this view has been met with multiple opposing views by researchers who believe that the affordance perspective is less about intuitive design and more about recognising the unexpected, situated, and emergent actions that actors may want to engage in with their devices (Fayard & Weeks, 2014; Costall 2012; 1995; Bloomfield 2010). For instance, Costall (2012, 1995) calls Gibson's affordance an 'asocial' mode of perception. He states that rules, representations, communication, and transmission of information cannot be taken for granted i.e., from without a context. It is all essentially derived from social practices. Human actors are active beings in the world, they primarily come to know in the world through their activities that are supported by informative and social structures. Costall (2012) states that material artefacts both invite and constrain their use even if their use does not align with the intended function. Affordances and their perception derived from artefacts are a product of social influence. If human beings are socialised, then so is their perception of affordances deriving from artefacts. Hutchby (2001) then proposed a way out of the determinism vs constructivism

debate: the technological shaping of social action. He counters the (over-socialised) conception of technology where interpretations of technology by social actors is given too much emphasis. He instead proposed that affordances of a technological artefact are not imposed on human actions but at the same time, artefacts can constrain or enable human actions.

2.3.2 Functional Affordances

Markus and Silver (2008) built on this relationality of technological affordances and conceptualised functional affordances as the “possibilities for goal-oriented action afforded by technical objects to a specified user group” (p. 625). Zammuto et al. (2007) state that affordances are the result of not only the functionality of the technology, but also on the expertise, organisational processes and procedures, controls, boundary-spanning approaches, and other social capacities present in the organisation. The key implication is that, whilst the existence of technical objects is independent of users’ perceptions, their affordances arise from users’ perception, interpretation, and appropriation of their properties. In other words, it is the capabilities of the technology, just as much as the choices people make about how to use those capabilities, which explain the ultimate effects that technologies have on human actors. They are two sides of the same coin (Leonardi, 2011). Markus and Macjchrzak (2014) further conceptualise this by stating that organizational structures determined by technical objects indirectly influence IT usage behaviour through the formation of beliefs about a technical object. Thereby differentiating between behaviours that are determined by technical objects and how technical objects are perceived by individuals before any action takes place. Robey and Anderson (2013) and Boillat et al. (2015) within their work on organisational routines state that IT artefacts can play a guiding role in human action. It serves as a template for enabling and constraining human action while not determining human performances, which will always remain open to human choice. New affordances may be perceived and used over time as human actors’ experiment with embedded IT artefacts, discovering new features that afford different kinds of human action.

The affordance research then takes a sociomaterial turn where research done by Leonardi (2019, 2013, 2011) and Faraj and Azad (2012) and Osch and Mendelson (2011) looks at how affordance theory can be a useful theoretical lens to bring back materiality within the “sociomaterial nexus” (Faraj & Azad, 2012, p. 5).

Leonardi (2011) elucidates portraying affordances “not as pre-existing in technology but as an emergent phenomenon. That affordances are not out there waiting to be realised (Norman, 1988) but rather affordances as enacted in practice through particular patterns of feature use” (p. 153). His work on imbrications argues that users' involvement with the system over time may affect the perception from what the system can do (i.e., affordances) to what it cannot (Leonardi, 2011). Strong et al. (2014, p. 20) acknowledge this possibility through their conception of affordance actualisation as a process entailing “journeys” stretched over time as users interact with shifting technology features. This process of actualisation resembles Leonardi's (2011) concept of imbrication in which distinct elements, both technical and social, are intertwined in practice over time. Faraj and Azad (2012) take a similar sociomaterial viewpoint and state that affordances of artefacts are not simply based on their materiality but also on relational properties that arise due to the symbolic and social nature of the setup. Technology affordances come about from the confluence between actor's line of action and the generative action possibilities in the technology. An affordance is thus a bridging concept that conceptually links between design and use of technology.

There have been several empirical studies that have supported the functional affordances and sociomaterial view. One specific domain in which the above two views have been used productively is the adoption and use of social media (Jung & Lytinen, 2014; Majchrzak et al., 2013; Treem & Leonardi, 2013; Kane et al., 2011). Treem and Leonardi (2013) examined how affordances of visibility, editability, persistence and association emerge within organisational use of social media and can affect processes as socialisation, knowledge sharing, and the exercise of power. Majchrzak et al. (2013) explain how affordances of social media emerged and induced a shift from a centralised knowledge sharing practice to decentralised online knowledge communal conversations. Prakasm and Huxtable-Thomas (2020) analyse how Reddit, a social media platform afforded the social construction of Trumpism. The Reddit platform influenced narratives by enabling the formation of certain types of self-expression.

Another specific domain has been the use of an affordance lens to look at software development. For example, Van Osch and Mendelson (2011) looked at users and developers as they used various tools, from which they developed a typology of affordances as designed, improvised, or emergent. Krancher and Luther (2015) employed an affordance lens to explain how the use of platform-as-a-service changed the work of software development teams. Within organisational research Siedel et al. (2013) look at how functional affordances emerge at the

interface between material properties of information systems, management interventions, and user characteristics in the use context of a large-scale organisational sustainability transformation. Grgecic et al., (2015) use Markus and Silver's (2008) lens including both functional affordances and symbolic expressions to unearth how beliefs were formed during the use of a student information systems at a university. More recently, Lehrer et al., (2018) studied the enablement of service innovation by big data analytics through an affordance lens.

While the above researchers discuss the importance of using an affordance lens, it is motivated to address the materiality of technology and does not equally privilege the social context. The notion of affordances in the above cases has conceded to be 'relational', but their relational character often appears to be "stripped" (Bloomfield, 2010, p. 417) where identifying the properties of technology and its consequent materially induced affordances and its interaction with human actors, is seen as addressing the relationality of affordances. As Bloomfield et al., (2010) state that "'cook-with-ability' is not a property of fires. Rather, humans have developed practices and equipment for making fires which are 'cook-with-able' and, importantly, for keeping them this way and thus preventing them from becoming house fires or forest fires which are not" (p. 417). Affordances or action potentials are said to be possessed by virtue of the artefact's functionality and thus independent of the actor's perception, knowledge, or culture. However, an affordance exists only so far as its use by human actors as informed by the social and cultural practices enveloping and shaping human action. A chair affords 'sitting' to give an outcome of a 'place of rest', only by virtue of the human actor's perception as informed by their social and cultural practices. For instance, to date, in Indian villages the children and the youth sit on the floor whereas the chairs are meant for the elders of the family or the elderly. Here the material artefact i.e., the chair affords sitting with respect to the family role or social status. Where elders are perceived to have a higher status within the family as compared to the young. So, the chair, in this case, is perceived as a symbol of status and the younger generation view the chair as 'un-sitable' for themselves.

2.3.3 Socialised Affordances

Within IS research there are fundamental dichotomies between the 'realist' ontology of affordances that aligns with Gibson's view and sees existence of affordances as independent from perception, and the 'relational' ontology of affordances which privileges not just the

materiality of technology but also the social (Robey et al., 2012). Most IS research within affordances is centred around functional affordances and is located at the level of the properties of technology and conceives affordances as embedded and directly perceived to be enacted by the human agent (Markus & Silver, 2007; Zammuto et al., 2008; Leonardi, 2011; Volkoff & Strong, 2013; Pozzi et al., 2014). Such a view often implies a linear causality in the sequence of existence-perception-actualisation-effect (Wang et al., 2018; Pozzi et al., 2014). Fayard and Weeks (2014) re-conceptualise affordances as a dualistic concept — i.e., affordances are both dispositional and relational. This conceptualisation gives a more useful interpretation to understand how people's practices and routine processes shape but at the same time do not determine their use of technology. It implies that affordances for a particular user arise from social practices that involve artefacts. The use and perception of such affordances is not directly informed by the material features of the artefact. It instead is a social process, where the outcomes and perceptions of artefacts are shaped by social structures, interactions, practices, cultural and historical understanding of the artefact in a specific context (Zheng & Yu, 2016; Bloomfield et al., 2010).

Depending on the viewpoint of the user, which is shaped by their socio-cultural context, and the narrative they are following, the same object can have meanings independent of the material aspect of the object for different groups of users. In that sense, affordances are constitutive of and instantiated within socially bound practices (Orlikowski, 2007). Affordances are rooted in a relational ontology that gives equal play to the material as well as the social. Zheng and Yu (2016) in their work on social media and collective action in China look at the aspect of socialised affordances. They explore affordances as both embedded and emergent from social processes within and beyond organisational boundaries. Where functional affordances arising from the features of technology socialise into collective action giving various outcomes within a specific political environment. As Bloomfield et al. (2010) suggest, “one way of approaching the analysis of affordances is to ask: how, and under what circumstances are particular ‘affordances’ made present? How and when are different action possibilities made available – or unavailable – to specific actors in particular settings? (p.420)” The ‘how’ aspect helps researchers unpack the *processes* through which a technology affords a particular outcome. The ‘when’ aspect pushes us to look at the broader social, institutional, and cultural conditions that impact the perception and outcome of affordances. At any given point of interaction between technology and the human actor, the interaction is supported by various social or organisational structures. For instance, the recording of data by a nurse in the IT system of her

hospital, is motivated by her immediate goal of meeting the data recording target, which is shaped by the larger managerial goal of the hospital. Her personal goal of recording more data than her peers is also shaped by the hospital's reward and recognition system. Both, immediate and group level goals are shaped by the larger organisational and institutional goals. In other words, these goals are shaped and mediated by the social context (Leidner et al., 2018).

While the socialised affordance lens, helps unpack the relationship between the technology and the social context that encroaches the human actor, the IS literature also discusses the concepts of social affordance, affordance socialisation and functional affordances. Given how the focus of this thesis is 'socialised affordance', it becomes imperative to understand what each term means and why I have chosen to use 'socialised affordance' specifically.

The term social affordance is defined as the properties of technological artefacts that enable or constrain social interaction within a given context (Hsieh, 2012; Sutcliffe et al., 2011). It is widely used in the computer mediated communication literature to understand the implication of technology on the aspect interactivity. The focus is generally on social capital, and how various social networking technologies afford different forms of social interaction for their users (Fox & McEwan, 2017; Wellman, 2003). Affordance socialisation on the other hand, is connoted with the aspect of acculturation (Leidner et al., 2017; Ashforth et al., 2007). It addresses how technology affords the socialisation process for human actors in their respective social environment. Socialisation is the process through which a human actor acquires, knowledge, skills, and the reasoning to behave in a socially compliant manner in each social setting. The emphasis here is on the human actor's social and physical environment and how that impacts their understanding and reasoning. Thus, affordance socialisation then is the process through which the action potential (affordance) of technology enables or constrains this socialisation process (Leidner et al., 2018). Functional affordances focus on the interaction between the capabilities of the technology and IT usage behaviour of users (Markus & Macjchszak, 2014). However, it does not link this interaction with the broader social structures of society. Lastly, outcomes of socialised affordances equate with actualised affordances i.e., action potential that has realised into outcomes for the human actor in their practices (Du et al., 2019).

My understanding of socialised affordance originates more from the way (Zheng & Yu, 2016), (Fayard & Weeks, 2014), and Costall (2012) use the lens. They use it to link the micro-level

(or immediate) interaction between the human actor and technology with the broader societal structures. It becomes the bridging point where technology meets the social context enveloping the human actor. Socialised affordances are essentially non-linear and derivative in nature. They emerge from the interaction between the functional affordances of technology and the institutional/social norms and rules (social structures) inclosing the human actor when the human actor interacts with a technology in their day-to-day social practices (Zheng & Yu, 2016). The socio-institutional rules and norms enveloping the human actor start to shape the interactions and perception of technology by them, thus leading to unintended/other social outcomes of technology. These affordances then become socialised and are not just functional in nature anymore. The socialisation process is very similar to the existing use of the socialisation term, where we see how affordances of technology get accultured into the social context and the everyday processes of the human actor. The focus of this thesis is not the aspect of social interaction or how human actors get accultured into an existing practice. In my study, the focus is social practices, that are embedded with rules, norms and learned behaviours and habits, and how they impact the way technology is perceived and used by human actors and consequently what (unintended) outcomes it gives for them. This helps researchers better understand the impact of or change caused by technologies within social practices. Such a lens can also be combined with other theories and help in providing a more inter-disciplinary understanding of how a technology mediates changes for organisations or for human actors within organisational rules and norms (Fromm et al., 2020). Even though the socialised affordance lens is an emerging theme in affordance and technology research, research within this is not as rich as with functional affordances and warrants further study (Zheng & Yu, 2016; Fayard & Weeks, 2010).

2.3.4 Actualisation of Affordances

To understand how affordances lead to change in practices, it is important to address not only the action potential that features of an IT artefact afford but also the processes of interaction between the technology and the human actor within a given context. All artefacts, technical or not, offer possibilities of action, if the actor possesses the ability to perceive and the goal to capitalise on that action possibility (Thapa & Sein, 2017). But the real effect of an action potential is only seen in its processes of actualisation. Many extant affordance studies implicitly assume that affordances are *de facto* actualised when there are appropriate actors (Majchrzak

& Markus, 2013; Seidel et al., 2013). This view emphasises that an affordance is an ever-present potential for action until it has been actualised, and that it is a fundamentally different perspective than merely looking at technology use or technology feature use. Affordances invite behaviours and other outcomes but are not the outcome itself (Karlsen et al., 2019; McKenna, 2019; Leidner et al., 2018; Evans et al., 2016). Du et al., (2019) in their study of affordance actualisation of blockchain implementation in an organisation, state that existing definition of affordance actualisation suffers from the “tautology of interchangeably using recognising affordances to actualising them” (p. 55).

Strong et al. (2014) define affordance actualisation as “the actions taken by actors as they take advantage of one or more affordances through their use of the technology to achieve immediate concrete outcomes in support of organisational goals” (p. 70). Du et al., (2019) refine the definition of affordance actualisation as, the goal-oriented actions taken by actors as they use a technology to achieve an outcome. They remove the word immediate because not all affordances have outcomes occurring instantly at the point in time of affordance actualisation. This is true particularly in cases where multiple individuals impact an outcome by actualising an affordance. In the cases where outcomes are unexpected, outcomes provide feedback to the affordances. In addition, realising basic affordances improves the actor’s knowledgeability and enables them to perceive and use the technology in a more advanced or different manner suiting to their goals (McKenna, 2019; Tim et al., 2018; Bygstad et al., 2016)

The organisational, institutional, and social context plays an important role for the affordance actualisation process. Bygstad et al. (2016), suggest that a conducive organisational context stimulates affordance actualisation, while an adverse context suffocates actualisation. How affordances are perceived and actualised is contextually influenced by cultural, social, and technical factors. The variability of the context can reveal different sets of affordances in a specific environment because affordances are always relative to an actor's goal (Volkoff & Strong, 2017). An IT artefact can provide multiple affordances, that is, bundles of affordances, to users, and these affordances are interconnected and interdependent in various ways.

Lindberg et al. (2014) propose studying the ecology or configuration of affordances across multiple IT artefacts, because in practice, users are choosing to actualise multiple affordances available from multiple IT artefacts simultaneously. Thapa and Sein (2017) through their telemedicine study in Nepal conceptualise the trajectory of affordance. They clearly distinguish between the affordances and its actualised outcomes and show how the affordances of IT, travel

along a trajectory through an interrelated web and emerge in practice. Leidner et al., (2018) in her research on the enablement of organisational socialisation through social media, states that affordances of different groups of actors intertwine to produce outcomes not just for the actors themselves but also for non-actors and that outcomes for one group of actors can produce affordances for another group of actors. Reider et al., (2020) look at the affordances of wearable technologies and its link to behavioural outcomes. They recognise affordances in their case as learning affordances and link it specifically to the actor's goals which are socially shaped. Therefore, actualisation of a wearable tracker depends on the socially and culturally shaped goal of the actor. Hence with a focus on actualisation, researchers can provide practical insights to policy makers or managers attempting to effect change through effective use of technologies.

However, while affordances and outcomes are conceptually different, in practice, much of the IS affordance literature does not distinguish between them sufficiently. Existing affordance research does not share practice of demarcating affordances from its outcomes or implement a standard terminology, where some authors prefer using nouns (e.g., association) while others prefer using verbs (e.g., associating) (Fromm et al., 2020; Leidner et al., 2018; Evans et al., 2016). This complicates distinguishing affordances that should describe action potentials from technology capabilities, features, uses, and usage outcomes. For example, Volkoff and Strong (2017) state the IS literature has many references to a “visibility” affordance. Visibility however is an achieved state and masks its precedent actions – and even the actor. Visibility is associated with two types of actors, the provider of the information, and the receiver. The former, by “inputting or sharing data”, might, during “making information visible” be engaging in various activities, from, “revealing information” (sometimes inadvertently), “telling” (deliberately), or “promoting” (actively). Similarly, the receiver, by “accessing data”, may be “observing”, “monitoring”, or “investigating”. The outcome “visibility” might be the subject of many action potentials. Actualising those affordances results in a particular outcome, such as visibility. The power of the affordance lens is that it helps to pinpoint the actors involved and the variety of potential actions they might engage in as they use the technology. (Karlsen et al., 2019; Karahanna et al., 2018; Volkoff & Strong, 2017).

Evans et al., (2018) suggest that affordances are multidimensional in nature. Instead of looking at one dimension of the dyadic relationships between users and technologies: either what users perceive of the technology or how they use its embedded features, we need to recognise the role of affordances in mediating the object-outcome link. Because ignoring this aspect of affordances reflects a theoretical leap and implies a deterministic argument where an object

leads to the outcome without any indication of the processes for the relationship. The existing inconsistencies in distinguishing affordance actualisation from the affordance itself, has resulted in the distinction between the feature use, affordances, and outcomes of technology to become muddled (Fromm et al., 2020; Evans et al., 2018, Leidner et al., 2018). Treem and Leonardi (2012) distinguish the technological features from its affordances by noting that features are static while affordances are dynamic, emerging from the relationship between the user, the object, and its features. In this way, individuals agree on common features of an object such as a table (e.g., number of legs) but may disagree about its affordances (e.g., eating, storing, or hiding) which could lead to different outcomes (e.g., storage of things or a place of safety) depending on how, the context enveloping the human actor and object enable or constrain its use and perception (Du et al., 2019; Leidner et al., 2018).

An important value that the affordance lens brings to technology research, is that it captures the non-deterministic nature of outcomes if we separate the action potential from the outcomes. But if we interchangeably use affordances to define affordance outcomes then we are falling back in the traditional IS outcomes research, which has largely failed to explain why there is a difference in the actualisation of affordances of similar technologies in different organisations and which characteristics of the organisation matter (Du et al., 2019; Leidner et al., 2018). Fayard and Weeks (2014) suggest that the traditional IS affordance definition explicates nothing about the level of granularity that is appropriate other than its relation to an actor or actors, who are capable of action with features of technology. It is instead more useful to keep and “complement the affordance theory with a middle range theory of practice that attempts to escape the false dichotomies of voluntarism vs determinism” (p. 238). This helps provide a higher explanatory power to understand both action potential and the actualisation process within a social context.

2.3.5 Ontology of Affordances

Volkoff and Strong (2017) suggest that, IS researchers should consider the underlying philosophical perspective they are using, to be sure about how the affordance theory provides an appropriate and consistent lens for research. For instance, the deep-rooted philosophical divides such as the subject-object dualism, structure-agency split, determinism vs voluntarism, make it difficult to develop an integrated formulation to overcome the social material. Although

Gibson did not state his philosophical orientation, others have described the critical realist nature of psychology (Volkoff & Strong, 2017; Faraj & Azad, 2012).

Ontologically, critical realists assert that objective reality is independent from human actors. Epistemologically, they assert that reality is incomprehensible because researchers view it through their existing knowledge and biases. Furthermore, critical realists believe that we only view a subset of all actual events i.e., empirically observable events. One cannot directly view the generative mechanisms that cause actual events, nor the relations between the elements within the objective reality. Researchers however, from their observation of events can retroduce those mechanisms. Stating that affordances exist independent of human perception indicates an underlying realist perspective – affordances are real and while they exist in relation to the actor, they do not exist only in the mind of the actor. The extent to which the actor is aware of them (if at all) will affect the actualisation, but not the existence of the affordance (Volkoff & Strong, 2017; Bygstad et al., 2016, Volkoff & Strong, 2013).

Critical realist researchers such as (Leonardi et al., 2019; Thapa & Hatakka, 2017; Bygstad et al., 2016; Faraj & Azad, 2012) conduct IS research to identify the underlying mechanisms that generate the phenomena being researched. Volkoff and Strong (2017) state that “affordance theory’s focus is on the relation between the IT artefact and users, while also maintaining the distinction between them, is what allows us to bring the IT artefact back into our research” (p. 12). In the same article, they also suggest the need to address the “social forces that affect affordance actualisation” (p.6). They do not however, highlight the emerging themes of socialised affordances or affordance for practice that already address the social forces enveloping affordance actualisation. While they acknowledge that affordances are not actualised in vacuum, but rather in a social context: “thus, social forces, arising from the groups within which the actors operate, also affect how, how well, or even whether any affordance will be actualised” (p.6). They however do not fully highlight the relevance of the broader social, institutional, or cultural factors that shape the processes of affordance actualisation.

Existing affordance research in their definition state that affordances emerge from relations between IT artefacts and human actors within a given context. But very few studies deeply delve into the context and explicate its impact on human action and technology usage while maintaining the distinction between the social and material. Emerging socialised affordance research can be studied from an interpretivist lens, as the social context by virtue of its social, cultural, and institutional constitution is subject to interpretation same as other theories of

technology that look at the socio-technical context. While a pure functional affordance lens warrants a critical realist lens, where technology and reality are seen objectively. A socialised affordance lens or an affordance for practice lens privileges the social context more equally with the materiality as compared to the functional affordance lens. Such a lens then can warrant an interpretive frame of research.

Existing technology and affordance research oscillates from IT enabled change (Markus & Silver, 2008; Zammuto et al., 2008) to the role of materiality within the sociomateriality of technology (Faraj & Azad, 2012; Leonardi, 2011) to the binding of the social and the material (Orlikowski & Scott, 2008) to technology use and perception being shaped by the social context (Zheng & Yu, 2016; Fayard & Weeks, 2014; Bloomfield, 2010). The above perspectives have delineated affordances as either embedded in the IT artefact or as emergent in practices within the realist and relational ontology, respectively.

This research adopts a socialised affordance perspective (Zheng & Yu, 2016) and grounds affordances as both dispositional and relational (Fayard & Weeks, 2014). I acknowledge that the functional features of technology are designed with a specific purpose and within a broader technical and managerial rationality which can enable or constrain its users in intended and unintended ways. However, I also pay equal attention to the aspect that technology and human actors do not exist in vacuum. All technologies and human action, goals, choices are supported by some or the other structure of society be it cultural, social, institutional, or organisational. Hence while an object's materiality might not be formed in practice, its perception and use are shaped by human action, norms, values that are supported by structures of society ultimately leading to different technology outcomes. People's perceptions of technology are shaped by organisational or institutional norms and rules. Even the pre-configuration of materiality as Leonardi et al., (2019) puts it, is done by designers within the organisational goals and norms in mind. Those very goals and norms are also developed in a socio-institutional context and shape the perception and interaction between the human actor and IT artefact. Social practices are not only that space where materiality of the objects and goals of users interact but also where peoples socially and culturally learned behaviours and perceptions shape the way technology is perceived and used.

The focus of this thesis is to critically deconstruct and refine the relationship between technology and empowerment. A socialised affordance lens, as my theory of technology not only addresses the functionality (materiality) of technology but also helps account for the

interplay between the socio-contextual processes and technology. It helps address the object-outcome link and delineates the action potential (process of using a technology) of technology from its outcomes as situated within a social context. Such a lens also helps delineate the processes of technological empowerment from empowerment outcomes of technology. I further integrate the socialised affordance lens with the social positioning lens. The structure (social positioning) and socialised affordance framework assists in linking the micro-level individual interaction with technology with the macro-level institutional processes (Jones & Karsten, 2008). This provides a more holistic account of the mediation of change in social practices and processes through technology during its use by human actors.

Conclusion

The above section presented the three theoretical perspectives that will assist me in answering the research questions of this study. Power and structure are seen as two elements of the social context that constantly reinforce and derive from each other. However, by analysing structural conditions and power processes separately, helps attain a deeper level of abstraction in understanding digital empowerment. It assists in unpacking the deep-seated inequalities of society which either get reinforced or mediated by technology. I present a table below that briefly summarises the theoretical concepts used in the thesis, along with their similarities and complementarities.

Theoretical Concept	Overview	Ontology	Epistemology
Social Positioning	<p>Link between social structure and agency/individual capabilities of human actors</p> <p>a social identity that carries with it a certain range (however diffusely specified) of prerogatives and obligations that an actor who is accorded that identity (or is an ‘incumbent’ of that position) may activate or carry out: these prerogatives and obligations constitute the role-prescriptions associated with that position (Giddens, 1979, p. 117)</p>	Social Constructivist	Interpretivist

Technologies of the Self	<p>Link between systems of domination and the self/individual capabilities of the human actor</p> <p>The ontological split of the human actor between the outside self, one that is subjugated by the power and knowledge from societal structures of power. And, the inside self, which is one's own moral and ethical codes that guide one's behaviour derived from the outside power and knowledge without being dependent on them (Foucault, 1982)</p>	Social Constructivist	Interpretivist
Socialised Affordances	<p>Link between the immediate human-technology interaction with the broader social structures of society</p> <p>Derivative and non-linear affordances that emerge from the interaction between functional affordances of technology and socio-institutional norms and rules enveloping human actors in day-to-day life (Zheng & Yu, 2016; Fayard & Weeks, 2014; Costall, 2012)</p>	Social Constructivist	Interpretivist
Complementarities		Dissimilarities	
Social Positioning and Socialised Affordances	Both lenses extrapolate the social context. Social positioning looks at how, and what social structures define the role prescriptions of a human actor. Socialised affordances assist in connecting these very social structures to the interactions between the technology and human actor in an immediate context.	<p>The Giddenesian view of social positioning, gives a more prominent emphasis on agency of human actors. Agency is seen as being shaped by social structures, but also as having potential to change social structures (Gidden, 1979).</p> <p>In Foucault's view however, there is little room for understanding agency outside of power relationships. Power networks, instantiated in societal</p>	
Social Positioning and Technologies of the self	Both lenses focus on the impact of the institutional structures and systems of domination on human actors.		

		systems of power, are seen as responsible for shaping the individual sense of self, with the self, having no real potential to change the systems of domination in society (Foucault, 1982).
--	--	--

Table (1) Complementarities and Dissimilarities in the theoretical concepts

2.4 Community Health Workers and mHealth

This section addresses the existing research around community health workers and mHealth within the developing country context. CHWs form the unit of analysis of this study and thus this section problematises the context of the CHW and its impact on the use of mHealth interventions by CHWs. CHW and mHealth literature is vast and spans across the health, health systems and ICT4D domain. I have been able to distil the keys debates and gaps from all three domains to highlight the motivation of the empirical study.

2.4.1 Community Health Workers (CHW)

There is a glaring inequity in the provision of health care services between high and low resource settings. Half of the world population lives in rural areas and are served by less than 38% of nursing workforce and less than 25% of required physicians (WHO, 2020). Task shifting and several healthcare reforms, have resulted in the transfer of many health care provision responsibilities from high-level health care to lower-level health care providers after special training. FHWs (frontline health workers) such as CHWs (community health workers), auxiliaries and midwives have been given the responsibility to provide crucial services such as treatment of communicable diseases like tuberculosis, malaria and HIV/AIDS, skilled birth attendance, immunisations, promotion of breast feeding, reduction of child undernutrition, and prevention and treatment of serious childhood illnesses in areas of high burden (Agarwal et al., 2015; Braun et al., 2013).

CHWs build bridges between formal health systems and rural communities, working to improve the relevance, acceptability, and accessibility of formal health services. Functions of CHWs include conducting home visits and collecting health information of the community/village members (also known as beneficiaries), reporting the health information to the local health centres, assessment and preventive treatment of disease, education and counselling and referrals for further care (Braun et al., 2013; Lehmann & Sanders, 2007). By directly visiting households, CHWs increase access to care for groups which are particularly difficult to reach, such as secluded women, the extremely poor, or the lowest classes of society subject to stigmatization. With their links to the health system, CHWs can also offer an entry point and at times directly provide health services, such as contraceptive methods, home-based care for people living with AIDS and community-integrated management of childhood illnesses (Ruton et al., 2018; Lehmann & Sanders, 2007).

The early literature stresses the role of the village health worker (VHW), which was the term most used at the time, as not only a health care assistant, “but also as an advocate for the community and an agent of social change, functioning as a community mouthpiece to fight against inequities and advocate community rights and needs to government structures” (Lehmann & Sanders, 2007, p. 3). But today the umbrella term “community health worker” (CHW) embraces a variety of community health aides selected, trained, and working in the communities from which they come (Lehmann & Sanders, 2007). The greatest value of the CHW concept lies in the fact that, by definition, they come from the community they are chosen to represent and presumably remain in close contact with the community. Language and cultural barriers often confront a more highly trained medical specialist and can often seem insurmountable. This social distance constitutes yet another gap for ensuring the smooth uptake of clinical interventions for the underserved rural population (Prasad & Muraleedharan, 2007; Lehmann & Sander, 2007). Typically, CHWs share linguistic, ethnic, and cultural background as the beneficiaries (health care recipients of the community). Evidence has also shown that providing CHWs with professional training can be instrumental for them in providing primary health care delivery; incorporating CHWs into the care team facilitates the building of trusting relationships based on shared backgrounds and experiences, serving as a conduit between patients and care providers through decreasing barriers to care. Once trained, CHWs are also able to diffuse health information within their communities using culturally acceptable and understandable methods (Bonnell et al., 2017; Agarwal et al., 2015).

In addition to being the link between rural communities and formal health care services, Hampshire et al. (2017) state that community health care work also has a moral dimension to it. Prince and Brown (2016) describe the implicit requirement for CHWs in East Africa is to “demonstrate a commitment to community development underlined by selflessness and the dedication of free labour”—a message reinforced through bureaucratic techniques such as the Kenyan National Strategy document which cited “respectability in the community and a good heart among the selection criteria for prospective CHWs” (Brown & Green 2015, p. 71). Such institutional rhetoric arguably then “shapes CHWs own political subjectivities, motivations, and capacities” (Maes, 2014, p. 108). For example, Glenton et al. (2010) found that CHWs in Nepal resisted financial rewards, which they believed would detract from the purity of altruistic motivation and undermine their social standing. Therefore, a health worker enacts more than one subjectivity towards her role. On the one hand there is an aspect of selflessness and care of providing health care to communities. On the other hand, their role and duties are also subjected upon them by the broader health care policy norms and rules.

However, in many cases CHWs can be at pains to emphasise their ‘passion’ and desire to ‘serve the people’, reproducing official discourses that demarcate ‘good’/caring (selfless from ‘bad’/uncaring (financially motivated) health-workers; “a distinction that may be more rhetorical and symbolic than reflective of actual practice” (Hampshire et al., 2017, p. 40). Evidence has also shown that even though the CHWs have been viewed as a change-agent through which communities could be engaged in health decision making, in a broader context, several CHW programs have been introduced without a supportive political and institutional environment (SOCHARA report, 2005). Due to which, when CHWs begin to facilitate a critical analysis of factors affecting ill-health in the community, they tend to appear as a threat to the existing power relations, in many cases some have lost their positions, and others may have even been killed. Conflict between the local leadership and the CHW has also been reported, adversely affecting the whole process of community participation in health care (Nandi & Schneider, 2014; Lehmann & Sanders, 2007).

CHWs during their routine workflow also suffer from issues such as extreme workloads causing the health information that is collected to be of poor quality, have errors, lag in reporting the data, poor response time of managing of emergency cases, lack of training and supervision, poor compensation, lack of institutional funding, changing managerial and political rationales and social factors such as caste differentiation (Early et al., 2019; Agarwal

et al., 2015; Braun et al., 2013). This also causes ultimately, for the blame of the rural health system's poor performance to come on them for poor quality information collected and the inability of meeting health targets, whilst not acknowledging the broader inefficiencies of the system such as lack of training and institutional support to CHWs. By their very nature, CHW programs are vulnerable, unless they are driven, owned by, and firmly embedded in communities themselves. Where this is not the case, they exist on the geographical and organisational periphery of the formal health system, exposed to the vagaries of policy swings without the wherewithal to lobby for and advocate their cause, and thus are often fragile and unsustainable (Nandi & Schneider, 2014; Hall et al., 2013).

CHWs in India

In the Indian context, CHWs play an integral role in connecting rural communities with formal governmental forms of healthcare (Scott et al., 2020). The inception of the Indian CHW programme in the 1970s was meant to follow China's barefoot doctor programme of providing decentralised and low-cost health care within low resource settings. It instead, over the years has still been a top down, bottom thin, hospital centric, doctor-nurse oriented health services system. Despite many initiatives, five-year plans, national health programmes, and CHW programs since the 1960s, there are still fundamental gaps, distortions, and contradictions. The basic architecture of the Indian health care model has been regarded as fundamentally inadequate in responding to village health care needs (SOCHARA Report, 2005).

The foundation of the Indian rural health system is grounded in the network of PHC (primary health care) centres and is also the main link to India's CHW programs (Scott et al., 2020). The CHW program consists of three cadres of health workers (Ministry of Health and Family Welfare, 2020).

ANM - The ANM or the *auxiliary nurse midwife* is the first cadre of CHWs and provides care at the sub-centre level. Subcentres are village level health centres that are housed under the primary health care. It is a centre where people from the local village/community can get basic medicines, health advice and referrals to the PHC centre by the ANM. The ANM cadre is the most well-educated and oldest cadre among the CHWs, having been established in the 1960s. Their main responsibilities include providing preventive and curative care to beneficiaries in the villages she visits. ANMs receive 18 months of training. They are today officially deemed

as Multipurpose Workers (MPWs) with a broad set of responsibilities such as collecting health data from the field and reporting it to the PHC centre in addition to providing preventive care. Some ANMs also obtain additional training to manage birth complications and refer women with complications to higher levels of care (Scott et al., 2020; Scott et al., 2019).

AWW- The second cadre is the *Anganwadi* Worker (AWW), who works solely at the village level and focuses on provision of health education and nutritional supplementation to young children, adolescent girls, and lactating women. They also help with promotion of healthy behaviours and mobilisation of the community for improved water and sanitation, participation in immunisation activities and other special health activities. The AWW is also well-established in the domain of childcare and nutrition, having been part of the health care system since the mid-1970s (Scott et al., 2020; Ved et al., 2019).

ASHA - The most recently created cadre is the Accredited Social Health Activist (ASHA), who also works at the village level. ASHA workers are given performance-based incentives that focus around facilitating institutional birth deliveries, immunisation services, provision of basic medicines (including oral contraceptives), and referral of patients to the sub-centre. The ASHA is an entirely new cadre, launched in 2005 in by the National Health Mission program of the government (Ministry of Health and Family Welfare, 2020). As the new and younger addition, ASHAs are monitored and supported by the ANMs and AWWs. The ASHA is seen by some policymakers as a means of reducing the labour burden on the ANM and is often seen as the ANM's assistant or helper (Ved et al., 2019)

ASHAs and AWWs are both recruited and chosen by the community, while the ANMs are hired and put into position by the district-level health administration. ASHAs are selected by and accountable to the local village-level government, called the Gram Panchayat, through a participatory process involving the community. After selection, ASHAs work closely with the Village Health and Sanitation Committee (VHSNC). The National Health Mission envisions the ASHA worker to “act as a bridge between the ANM and the village and be accountable to the Panchayat (local democratic government)” (Scott et al., 2020, p. 3). All 3 cadres of CHWs play a pivotal role in the provision of outreach reproductive, maternal, new-born, and child health and nutrition (RMNCHN) services within rural communities in India and operate under the PHC centre (Wahid et al., 2019; Ved et al., 2019; Ministry of Health and Family Welfare).

A systematic review done on the ASHA program in India by Gopalan et al., (2012) looked at the various individual, environmental (health systems), and community level factors that

affected ASHA workers while carrying out their responsibilities. At an individual and community level what motivated ASHAs were the aspects of altruism and social responsibility of their job role. Being able to participate in community meetings, receiving peer support and receiving recognition of their work in the eyes of the community. At the level of the health systems however, ASHAs appeared to be demotivated due to increases in workload, limited autonomy to move around and execute responsibilities, and poor incentivisation (Gopalan et al., 2012). ASHAs to some extent did feel empowered through the acquisition of knowledge and skills by the training that was given to them and from peer support which led to a healthy competition amongst the ASHAs to perform their work. However, simultaneous aspects of deterrence were also felt and centred around the community's lack of trust in the public health care system. For instance, the unavailability of drugs at the sub-centre due to the stockout and long replenishment times, grounded in the poor communication between the ASHAs and ANMs and their supervisor at the PHC centre, would lead for community members to resort to informal private health care providers. This would have a direct impact on the credibility of the ASHAs and ANMs and the ability to perform their role (Wahid et al., 2019; Gopalan et al., 2012).

Due to poor training and supportive supervision, CHWs (ANMs, ASHAs, AWWs) sometimes were also reported having an inadequate level of knowledge. Then being asked to constantly attend refresher trainings at health centres to remote areas took away their personal time, making them feel overburdened. CHWs also experience having limited autonomy at work to perform their social responsibilities beyond the specified guidelines (Carmichael et al., 2019; Gopalan et al., 2012). While for rural women becoming an ASHA/ANM/AWW is seen as an opportunity for empowerment – individually, socially and to some extent financially. As they are placed right at the nexus of the health system's status and their community, existing problems covering both these aspects then directly impact their credibility (Scott et al., 2019). Some PHC centres also followed a dress code that would symbolise them with a higher status of working for the government in their community. Aspects such as the higher caste of the ASHAs, ANMs, PHC centre staff and doctors then established a different kind of power structure at the local PHC centre creating issues in the accessibility of health care for the lower castes (Som, 2016).

One of the main goals of the Indian CHW program was to ensure institutional birth deliveries. Within rural areas, many cultural and traditional methods of birth deliveries prevail (e.g., giving birth by squatting in the village) which would often also result to high maternal or infant deaths

(Prinja et al., 2016). But despite the intervention of the ASHA and ANM worker, the apparent ‘safe’ institutional delivery was questionable. In some cases, as the ANM lived in another town/village, by the time she arrived, the delivery would have been conducted by the local midwife. In another case, “the ANM used a *charpai* (cot woven with rope commonly slept on in villages) for deliveries, while in another case, as there was no electricity, the ANM had to make do with a lantern” (Som, 2016, p. 34). It was also not unknown for inconvenient transportations like motorcycles being used to take women in labour to the primary health care centre (PHC). Despite these issues, the ASHAs and ANMs tried convincing women that institutional deliveries—the largest source of income for them—were safer. Other factors leading ASHA/ANM credibility issues include women beneficiaries failing to decide on receiving appropriate care due to their low knowledge and awareness. In situations where beneficiaries did have good maternal health knowledge and a positive health seeking behaviour, they were often, not the sole decision-maker regarding their health treatments and were strongly influenced by their husbands or (mother) in-laws. The inability of women to reach the health centre due to long distances, poor rural roads, lack of financial support and prevalence of traditional birth practices would undermine the need for institutional deliveries thereby undermining the role of the CHWs (Gopalkrishnan et al., 2020; Scott et al., 2019; Prinja et al., 2016; Agarwal et al., 2015). The government under the NHM National Health Mission program (previously known as National Rural Health Mission) then introduced various schemes for maternal and child beneficiaries to address some of these barriers. These schemes have been listed in table 2 below.

Maternal Health Scheme	Description
Janani Shish Suraksha Karyakaram (JSSK)	<p>For pregnant women: Free and cashless delivery and exemption from user charges. Free C-Section. Free drugs, consumable, and diagnostics. Free diet during stay in the health institutions. Free provision of blood transfusion. Free transport from home to health institutions. Free transport between facilities in case of referral. Free drop back from Institutions to home after 48hrs stay.</p> <p>For sick new-borns and infants: Free treatment. Free drugs and consumables. Free diagnostics. Free provision of blood transfusion. Free transportation to and from health institutions (Ministry of Health and Family Welfare, 2020)</p>

Janani Suraksha Yojana (JSY)	<p>Promotion of institutional delivery among poor pregnant women.</p> <p>It involves the provision of cost assistance to both the woman who delivers at the health care facility and her ASHA or ANM. In rural poor performing states of India, the woman would receive 1400 rupees (14 GBP) and her ASHA/ANM would receive 600 rupees (6 GBP) per institutional delivery (Ministry of Health and Family Welfare, 2020)</p>
Mamata Vahan Scheme	<p>Mamata Vahan is a part of the NHM ambulances/ patient transport vehicles which primarily transports pregnant women to government hospitals, PHC centres and community health centres for delivery and back home afterwards (Ministry of Health and Family Welfare, 2020)</p>

Table (2) List of maternal and child health maternal schemes

However, evidence suggests that implementation barriers, such as the mode of payment, e.g., direct bank transfer, affected the effectiveness of these schemes (Ilozumba et al., 2018). When women can overcome some of these barriers and reach the health facility, aspects such as the quality-of-care women receive at the health facility become a problem. Quality of healthcare is negatively affected by many factors, including health worker shortages and poor availability of equipment and medicines, disrespect for patients, corruption, and poorly equipped facilities (Seshadri et al., 2019; Scott et al., 2019; Ilozumba et al., 2018; Prinja et al., 2016).

A 2011 study of the CHW programme in Bihar and four other Indian states identified implementation challenges such as insufficient levels of incentives and compensation and lack of reliable support and supervision for the CHWs (Bajpai & Dholakia, 2011). Subsequent studies across India have consistently found similar issues and have called for reforming the CHW programme to enhance the motivation and capability of CHWs to contribute to the PHC system's performance (Ilozumba et al., 2018; Prinja et al., 2016; Gopalan et al., 2012). These challenges appear to reflect issues of relations and power that may be deeply rooted in collective norms, practices and routines that are perpetuated by ongoing managerial practices. "One of the more salient of these was exemplified by the thwarting effect that public blaming and shaming and reprimands have upon CHWs' motivation and job (dis)satisfaction" (Som, 2016, p. 16). The understanding of contextual conditions and processes is required to explicate what factors can support workers' basic psychological needs for autonomy, competence, and relatedness which, in turn, can contribute to self-motivation, job satisfaction and organisational commitment. External norms such as rewards, incentives, and positive feedback, among others,

can satisfy the needs for competence, autonomy, and relatedness if/when these become internalised by the CHWs (Gopalakrishnan, 2020; Ved et al., 2019; Nyemba-Mudendo & Chigona, 2018; Hampshire et al., 2017). Many studies have also shown that the involvement of locally based NGOs and community-based organisations through public-private partnerships have been a complimentary mechanism to support and empower CHWs in India (Modi et al., 2017; Agarwal et al., 2015; Gopalan et al., 2012).

2.4.2 Community Health Workers and mHealth

The introduction of information and communication technologies (ICTs) to rural CHWs has shown to bridge lacunae in their work environment resulting from under-capacitated facilities, constrained access to information and delayed responses to emergencies (Hall et al., 2014; Braun et al., 2013). This has resulted in mounting interest in the potential of e-health (the use of ICT for health) and m-health (the use of mobile communication technology for health, a subset of e-health) in poor, rural and marginalised communities. The World Health Organisation (WHO) has defined the use of eHealth as an approach to health and related fields, that utilises information and communication technologies (WHO, 2017). Underneath the broad umbrella of eHealth, they define mobile health (herein referred to as *mHealth*) as the use of technologies, such as mobile phones and personal digital assistants, to provide health care services and information.

The implementation of mHealth interventions in developing countries is generally done as an extension of the existing health information system (HIS) that is centralised and top down (Sahay, 2016; Mukherjee, 2015). Due to the top-down nature of the large institutional HIS implementation, many bottlenecks have been recognised through previous research such as lack of coordination, poor quality and use of information, and limited focus on information for local action. Due to the involvement of numerous stakeholders ranging from international and national donors to government authorities, multiple rationalities of information system integration emerged resulting in different modes of organising and collecting health information (Chilundo & Aanestad, 2004). CHWs working closely with the beneficiaries found it difficult to focus on the more social and altruistic aspects of their work and instead found themselves largely being pressured to perform their routine tasks to complete the aspects of meeting the larger institutional health and data targets. Instead of focusing closely on

monitoring community health improvement and understanding which aspects help improve CHW performance, the health system's focus became more on monitoring progress for the sake of publishing health indicators and showing the capability of the HIS that would meet health targets set by international agencies and show donor funding evidence (Mukherjee, 2015; Kimaro & Nhampossa, 2005).

However, there is high evidence on the usability and acceptability of mHealth interventions by CHWs within the developing country context despite the issues revolving around HIS programs. Many mHealth studies (Early et al., 2019; Ruton et al., 2018; Sondaal et al., 2016) suggest that, mobile based data collection improves promptness of data collection, reduce error rates, improves data completeness and emergency referrals, work planning through alerts and reminders, and improves supervision of and communication between healthcare workers. Agarwal et al. (2015) found that health workers could easily learn how to use mobile phones and apps and once trained, found the features available via a mobile to be useful in relation to reinforcing and improving the services they already offer.

Braun et al. (2013) found that most programs utilizing mHealth technology use by CHWs addressed issues related to maternal, child, sexual, and reproductive health, with more than half of this group specifically focused on HIV/AIDS healthcare provision. Many of these studies have also revealed that when mHealth is incorporated into an already existing maternal health care programme, women believe that they are receiving better care and are more likely to change behaviours, feel empowered to actively engage with health resources, and have an increase knowledge related to danger signs (Ledford et al., 2016; Mangwi Ayiasi et al., 2015; Prinja et al., 2017). For instance, in the maternal Wired-Mothers intervention of Lund et al. (2014; 2012) the odds of a woman receiving four or more ANC (ante-natal care) visits by the CHWs almost doubled because of the reminder feature of the technology.

Systematic reviews done by (Early et al., 2019; Agarwal et al., 2015; Braun et al., 2013) show that the use of mHealth by CHWs in low resource settings firstly, ensured CHW compliance to standards and guidelines when delivering health services in the field and during data collection through the decision support, alert, and reminder features. Secondly, mHealth also became a medium to support education and training of CHWs. mHealth features helped geographically dispersed CHWs with timely and accurate information, shared through various multimedia formats. Florez Arango et al. (2011, p. 135) state that “although CHWs are the backbone of health care delivery in developing countries, they too often have little formal

education and training, and so devices that use a combination of text, audio, images, and video can be used to improve their ability to provide quality community-based care”. Thirdly, mHealth also helps improve the communication between CHWs and their supervisors, by providing real time advice, information, and support. In the Aceh-Bihar midwives’ study in Indonesia, the use of mobile phones was positively associated with access to institutional and peer information resources, which was in turn positively associated with an increase in knowledge about best practices for providing obstetric care (Chib et al., 2008). Fourthly, mHealth features also help facilitate the management of remote supervision of CHWs and their job performance through the GPS features and automated texting system. For instance, in the CommCare project in Tanzania, a comparative study was done to understand the effects of the automated text-message system on the real time job performance of the CHWs. Compared to a group of CHWs who did not receive alerts and reminders, CHWs who received these messages improved their numbers of timely visits to expectant mothers (Svoronos et al., 2010). In further studies, researchers revealed high rates of acceptability, use, and satisfaction with the alert and reminder system by both the groups of CHWs and their supervisors. Fifthly, the aspect of improvement in the quality and reporting of data was cited with the use of mHealth applications. Numerous studies found that various features of the mobile technology such as a systematic interface for feeding in and retrieving the data ensured that there were fewer errors in the data compared to the paper-based system of data collection (Sondaal et al., 2016). Mobile-based data entry permits checking for logic flow and has capabilities to identify incorrect entries, thereby reducing error rates. It also became easier to detect data falsification and to compile reports and collate data as compared to paper-based data collation (Schoen et al., 2017; White et al., 2016; Sondaal et al., 2016). mHealth interventions help improve the workflow of CHWs by eliminating several shortcomings that they face in the field such as the increased work load of managing paper registers and collating data in them, lack of standardisation of collecting and reporting data, loss of paper documents, poor communication with supervisors, difficulty in scheduling household visits and follow-up appointments with patients, poor communication with the beneficiaries due to lack of resources and limited data security (Gopalakrishnan, 2020; Ilozumba et al., 2018).

Some studies have also showed how the use of mHealth technologies resulted in psychosocial changes for CHWs. Many studies have reported that the use of mobile phones improved CHW motivation and empowerment and improved their credibility in the community (Gopalakrishnan, 2020; Ilozumba et al., 2018; Bonnell et al., 2018; Nyemba-Mudende &

Chigona, 2018). Chib et al. (2008) categorised some additional psychosocial benefits as follows: opportunity production, capabilities enhancement, and social enabling and knowledge generation of CHWs through mHealth. Lee et al. (2016) reported similar findings where cell phone use among midwives was positively associated with higher self-efficacy and health knowledge. Researchers of many studies highlight that mHealth interventions can support and empower CHWs in their role as a bridge between formal health systems and communities. Use of mHealth strategies can potentially circumvent several of the structural and systemic barriers faced by CHWs in delivering health care (Scott et al., 2019; Ilozumba et al., 2018; Nyemba-Mudende & Chigona, 2018).

CHWs and mHealth in India

Similar findings have been found in the Indian context. To supplement community health worker training and retention of knowledge, mobile technology has been considered as an effective and sustainable method within many Indian states (Nimmagadda et al., 2019; Ilozumba et al., 2018; Prinja et al., 2018). With the widespread use of mobile phones in the rural areas of India, reliable health information has been easily made accessible even in the remotest areas. Built-in tools with health messages in the mobile phones have been used by the community health workers as an aid for counselling pregnant women and nursing mothers (Ilozumba et al., 2018). The launch of the government health information systems platform of MCTS (Mother and Child Tracking Software) (Sahay, 2016; Gera et al., 2015; Mukherjee, 2015) ensured the integration of technology for data reporting in some PHC and district health centres, where data would be fed in computers at the centres by ANMs or ASHAs.

In many other states, public-private partnerships have prevailed wherein NGOs (non-governmental organisations) in partnership with the respective state government intervene with mHealth interventions to provide support for CHWs. Examples such as ICTCCS in Bihar (Carmicahel et al., 2016) mSakhi in Maharashtra (Patel et al., 2019), ImTecho In Gujarat (Modei et al., 2017), ReMind in UP (Prinja et al., 2018), CPHM in Karnataka (Naik et al., 2020) and MfM in Jharkand (Ilozumba et al., 2018) are some of the mHealth interventions that are managed through governmental partnership with NGOs, where CHWs use mobile communication technologies in the form of smart phones and/or tablets to collect and report

data from the field which is then fed into the MCTS HIS platform from the computer centres at the PHC centre.

A few key examples addressing the nuances of both the positive and negative effects of Indian mHealth interventions include the ICTCCS, MfM and ReMind mHealth applications.

The ICTCCS mHealth application was designed as part of an existing health program which has been implemented in several districts in the state of Bihar (Carmichael et al., 2016). The programme's long-term goal was to reduce rates of maternal, new-born, and child mortality, and child undernutrition. The ICTCCS was used by ANMs and AWWs to increase the coverage, quality, and coordination of maternal, child and reproductive health services; enhance and align their communications with beneficiaries; and facilitate their supervision. The use of the mHealth application did improve certain behaviours amongst the CHWs in terms of prenatal and antenatal care such as following up on the home visits in the late antenatal period, and in the uptake of skin-to-skin care, breastfeeding immediately after delivery, and age-appropriate complementary feeding. While for the ASHAs the mHealth application became a medium of increased knowledge and increase in self-confidence, but due to the equalizing of the roles in the process of task shifting the AWWs felt less confident and the need for more training. This had a direct impact on the reinforcement of existing coordination problems between the ASHAs and AWWs. Another aspect that led to the weak reception of the mHealth application was the parallel continuation of the paper-based system of collecting data which lead to an increased burden of the workflow for the CHWs (Carmichael et al., 2016).

Similar findings were established through the MfM project. The Mobile for Mothers (MfM) application was conceptualised by 2 NGOs in collaboration with the state of Jharkhand for use by CHWs to improve the delivery of maternal services and the health awareness regarding maternal health knowledge (Ilozumba et al., 2018). The study revealed that CHWs with low literacy levels had problems in understanding and using the MfM application. Some also reported having problems with the mobile phone hardware itself, poor mobile connectivity, and poor access to charging points. However, they also reported that the use of the app helped improve their knowledge which in turn improved their credibility in the eyes of the beneficiaries. CHWs shared that the mobile phone improved their ability to perform tasks by enlightening them on issues which they were previously ignorant about, such as the number of required ante-natal care visits to the beneficiaries. They explained that the intervention also improved their ability to explain concepts to their community members with the recall and

delivery of essential information. Prior to the implementation of MfM, they had books/registers to assist with their recall, however, the mobile application appeared to improve their ability to deliver consistent information to all women. In this way, MfM reduced their mental workload but also improved the efficiency and accuracy of information relayed (Ilozumba et al., 2018).

Then a study conducted around the ReMiND (Reducing Maternal and Neonatal Deaths) project in the state of UP revealed that the mHealth app helped ASHAs to register clients, provide real-time guidance through key counselling points and reduced the use of paper registers (Prinja et al., 2018; Prinja et al., 2016). It also helped them improve their knowledge retention during their interaction with the beneficiaries. While poor network issues, other infrastructural barriers, and an increase in visibility of the ASHAs' performance were cited. The intervention resulted in the improved recognition of the danger signs during a pregnancy and an increase in uptake of preventive services like ANC (ante-natal care) by the beneficiaries. These changes assisted in leading a reduction in the number of maternal and neonatal illnesses and therefore, decreased the demand for curative care (Prinja et al., 2016).

Despite the many improvements in the workflow processes of the CHWs, they are also plagued with several social and infrastructural constraints. In the Indian context, the acceptability and usability aspect greatly differ in many settings. Infrastructural barriers such poor electricity, lack of mobile connectivity, faulty hardware, lack of charging points, theft, security, poor roads, poor PHC facilities, lead to a weak acceptability and reception of mobile communication technologies by CHWs (Scott et al., 2019; Naik et al., 2020; Ilozumba et al. 2018; Modi et al., 2017; Prinja et al., 2016). Social barriers such as the existing lack of trust in the public health care system, prevalence of traditional and religious beliefs of giving birth at home, poor credibility of CHWs due to lack of knowledge and training, and poor communication with the PHC supervisors created discrepancies in the number of maternal and infant beneficiaries being registered in the mHealth app versus the number of beneficiaries deciding to resort to the PHC centre for treatment (Naik et al., 2020; Ilozumba et al. 2018; Modi et al., 2017; Prinja et al., 2016; Sahay, 2016). The combination of both social and infrastructural barriers questions the very relevance of mHealth interventions.

Schoen et al., (2017) suggest that a qualitative inquiry into CHW and mHealth research is needed to understand the various social factors that act as barriers for successful mHealth adoption. While a qualitative approach can limit the capacity to quantify data, it can allow for

a better appreciation of the socio-cultural complexities of the context in which CHWs perform their routine tasks. In addition, what is also required is a clear theoretical perspective in both systems design and CHW-mHealth research to understand the acceptability and usability of mHealth programs. (Ilozumba et al., 2018).

2.4.3 Empirical Research Motivation

mHealth studies from a health systems and practitioner's point of view, focus more on problematising the existing inefficiencies of the health system where technology is seen as a solution to improve the workflow of CHWs (Modi et al., 2017; Agarwal et al., 2015; Braun et al., 2013). The research methodology generally adopted for such studies centres around randomized control trials (RCTs), as this helps practitioners understand how the intervention of technology can assist in delivering health outcomes within rural communities. While mHealth research from an ICT4D perspective focuses more on the failure of technology to deliver its outcomes (Nyemba-Mudenda & Chigona, 2018; Sahay, 2016; Mukherjee, 2015). The focus then becomes to understand how and why technology leads to failure. However, both health systems and ICT4D research do not pay enough attention to the unintended outcomes that technology delivers for CHWs. Adopting a socio-technical perspective towards mHealth research places importance on the *perspective of the CHWs* to understand how the interaction between the CHWs and technology in their social context impacts them during their regular workflow processes (Nyemba-Mudenda & Chigona, 2018; Gopalan et al., 2012). It is the CHW that is placed at the nexus of the community and health system. Hence, it becomes important to also account from the CHW's perspective how mHealth interventions are aiding or constraining them in their everyday work processes. The subject of empowerment (or disempowerment) here is the CHWs. Understanding which social processes are empowering (or not) for the CHWs helps better understand the reason behind the acceptability and usability of mHealth interventions.

In the Indian context, mHealth interventions are implemented within the existing CHW program. Therefore, technology gets implicated within the existing issues that ASHAs, ANMs and AWWs face in the field (Carmichael et al., 2016). The existing CHW context could thus potentially influence the outcomes of an mHealth intervention. Existing infrastructural and local health system level problems (local power relations, caste differentiation, infrastructure

issues etc.) could be both limiting or enabling factors to mHealth intervention effectiveness (Gopalakrishnan et al., 2020). Overall, these factors point to the complexity of introducing mHealth technology within the Indian public health care system.

The motivation of this empirical study is to understand from the worldview of the CHWs, how mHealth interventions are socially impacting them, and in the process are they getting empowered or disempowered? This is analysed by addressing the socio-structural determinants that contextually influence the role of the health workers (Nyemba-Mudende & Chigona, 2018; Chib et al., 2008). Secondly, the data in this study will also be analysed to unpack the subjectivities that health workers enact, where on the one hand, their role subsumes a sense of altruism and social responsibility, on the other hand they are also subjected to the larger reproduction of power as instantiated through the managerial and technical rationality of the health system (Hampshire et al., 2018; Chib et al., 2008). I aim to show the dialectical interplay between the enhancement of individual capabilities of the CHWs and the structural reproduction of power. Together the lens of structure and power should help me understand how and why technology leads to uneven outcomes for the CHWs, thereby also highlighting the usability and acceptability aspect of mHealth interventions from the CHW's perspective. This should enhance my understanding on how, and if the mHealth technology truly empowers the CHWs and enables them to assist their communities in realising the potential in access to health awareness and formal health care services.

While majority of the mHealth research in India is done from a health system's perspective that looks at the link between technology and health outcomes. And ICT4D research looks at the HIS (MCTS) of India, this research specifically looks at the perception of, and interaction with the mHealth technology (android tablets) by CHWs in their regular workflow processes.

Chapter 3

3. Methodology

This chapter presents the research methods and philosophy adopted in this study.

3.1 Research Methodology

In this section, I present the methodology of this research. This section is divided into five subsections. The first subsection presents the ontological and epistemological assumptions that guide the research process and my justification of using a qualitative approach and an interpretive case study design. This is followed by a detailed overview of the case study. It includes a description of the context and the 2 research sites where the data was collected and will also explain how access was obtained to both the research sites. I finish this section by presenting the research methods of semi-structured interviews and field observation. The next section will address the data analysis, which will also focus on the three publications of the thesis. The final section addresses the management of ethical concerns, and the process of reflexivity and positionality.

3.1.1 Research Design

3.1.1.1 Ontological and Epistemological assumptions

The ontology of a research study is concerned with the very nature of reality: how one views the knowledge about world (Myers, 2009). Is the world out there an external reality independent of people's beliefs and their understanding of it, or is the knowledge of it actively constructed through meaning within their social life? (Ritchie & Lewis, 2003). It is my view that social, cultural, political, economic, and philosophical values in society shape our local and specific realities which are constructed by us. Contrarily, in the spirit of advocating for a true state-of-affairs, a realist ontology can lead the research to fall into a set of context free generalisations (Myers, 2009; Guba & Lincoln, 1994; Fish, 1990).

My belief stands on the ground that human beings experience the world at a given place and time through a set of multiple and dynamic meaning constructions (Guba & Lincoln, 1994). Therefore, for every human subject, there is an autonomously constructed reality. As Crotty (1998) puts it “constructionism is the view that all knowledge, and therefore all meaningful reality as such, is being constructed in and out of interaction between human beings and their world and developed and transmitted within an essentially social context” (p. 46). A central tenet of social constructionism is that people’s motivation of producing their own understanding highlights the ‘social’ element of this epistemology. Crotty (1998) asserts that reality, as per the way in which it is constructed, “is not developed in a vacuum: it is, instead, built in the social context in which all individuals are immersed” (p. 55). Thus, human beings develop their subjective views within institutional and social structures, which condition, precondition and prescribe the way they perceive their world (Crotty, 1998).

To inscribe my research in its epistemology of reference, I start from my broader question, through which I initially conceptualised my problem area: how is technology implicated in processes of empowerment? The lenses used to address these processes are structure and power, i.e., the lens of social positioning and technologies of self. Both lenses, address the ‘*social*’ aspect surrounding technology use. Analysing human beings as enacting various subjectivities or being impacted by their social relations, is subsumed within the domain of social constructionism. Human actors construct meaning and enact subjectivities, as informed by their social relations within structures of domination, legitimation and signification which ultimately inform their perception and use of technology. This implies that human beings, rather than “discovering” reality as an objectively observable truth, can only “construct” it through engagement with the world (Orlikowski & Baroudi, 1991). Theoretical perspectives inspired by this epistemology, are then referred to interpretivist approaches.

3.1.1.2 Interpretivist Frame of Research

Social constructionism constitutes the epistemological root of interpretivism and is key to reading and understanding its prescriptions (Orlikowski & Baroudi, 1991). Interpretive research in IS, is “aimed at producing an understanding of the context of the technology, and the process whereby the technology influences and is influenced by the context” (Walsham, 1993, pp. 4-5). It is based on the belief that: “the same physical artefact, the same institution,

or the same human action, can have different meanings for different human subjects, as well as for the observing social scientist” (Lee, 1991, p. 347). Thus, the use and perception of technology then is given meaning to, through the exploration of the phenomena which arises out of social interaction. Although technology does have its material features which permit a certain functionality, they are designed and used by human actors in a specific social context (Klein & Myers, 2001; Doolin, 1998).

An interpretivist philosophy states that, to understand processes, the researcher needs to get ‘inside the world’ of those very human beings generating it. Interpretive researchers focus on people’s ‘lived experiences’ so that people’s social constructions of their reality can be interpreted by the researcher (Myers, 2013). This is done by understanding and focusing on their meanings and interpretations, as well as the researcher’s (Orlikowski & Baroudi, 1991). The research process in this is then largely inductive as “the meaning of a particular word depends upon its context within a sentence, paragraph, or culture. Without an understanding of this broader context, it is impossible to understand the correct meaning of a single piece of data [...]. Similarly, then, the meaning of a social phenomenon depends upon its context, the context being the socially constructed reality of the people being studied” (Myers 2013, p. 40). In this research I used an abductive approach where theory development and empirical observations were simultaneously scrutinised. This is discussed in further detail in the data analysis section of this section.

I consider that one of the advantages of this approach is that due to the proximity between the researcher and those studied, the researcher can understand the participant’s actions. The researcher is not only able to have a dialogue with the participant regarding it but also observe and make sense of the participant’s version of reality (Crabtree & Miller 1999; Lather 1992). This has guided my research from its inception. By interviewing and observing the health workers and the PHC (primary health care) staff, the point is to understand their version of reality which then impinges on their perception of technology during everyday use. In my research, I recognise the value of observing the status quo and questioning the embedded structural contradictions within a social phenomenon. I believe that the world is full of assumptions, and many of these we take for granted. For instance, technology developers, governments, global north countries, international development organisations assume that implementing technology in a socio-economically backward region will ‘empower’ people with better access to resources, or digitisation of workflow processes, increase literacy,

improve health and education etc. Using the term ‘empower’ without understanding the very processes through which users get empowered, is the primary reason as to why so many technologies fail to live up to expectations or give unanticipated and uneven consequences (Narayan, 2005; Alsop & Heinsohn, 2005; Bartlett, 2004; Hill, 2003; Doolin, 1998). This study has been framed to understand this very aspect from a lens of power and structure. Both structural conditions and power processes are responsible for the organisation of society and in mediating societal change (Klein & Myers, 2001). They constitute the social context that subjectively condition and precondition the perception and use of technology by human actors in a locally situated context. Since interpretivists acknowledge truth as a relative concept which depends on one’s subjective perspective, I consider this epistemological stance to better suit my research focus. Therefore, this study’s approach draws on interpretivist perspectives in which, instead of seeking an objective, transparent view of these settings, I use my own subjective experiences – often closely tied to the subjects studied – to generate intersubjective knowledge. Generalisation of results, unlike positivism, which is based on sampling and statistics, is structured along a theoretical lens within interpretivism. Therefore, my findings are not generalised through a statistical sample but through theoretical propositions in this research (Lee & Baskerville, 2003; Yin, 2003).

3.1.1.3 Qualitative Research

Qualitative research becomes a useful approach to interpret a phenomenon when studying and understanding the participant’s worldview in their natural setting (Ritchie & Lewis, 2003). It becomes a sensitising research approach for examining social relations and the “pluralisation of the worlds” (Flick, 2009, p. 12). Denzin and Lincoln (2005) propose that qualitative research, can be described as “a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, including fieldnotes, interviews, conversations, photographs, recordings and memos to self ... qualitative researchers study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them” (p. 3).

It was Max Weber who proclaimed, that science’s task is the “disenchantment of the world”. Quantitative approaches do not permit a full understanding of a social phenomenon (Beck & Bon 1989; as cited in Flick 2009). It can show the interrelationship between two variables but

not give the direction of the relationship or address the social factors which cause for the relationship to exist in the first place (Denson & Lincoln, 2005). This resulted in the importance of qualitative research methods that aid in recognising the social factors that impact the participant's perspectives and their diversity and is open to subjectivity and interpretation. Following this understanding, this research is qualitative because it seeks to discover and develop new knowledge about the phenomena of empowerment from the subjective perspectives of the very people (CHWs) going through an empowering or disempowering process. It seeks to place attention on the findings, which are grounded in empirical material rather than in theories already formulated in advance (Flick, 2009). Furthermore, it looks at the phenomenon and starts from the subjective and social meanings related to it. These are all features that would not be possible through a quantitative research design. The concern for this research is to answer the 'how' rather than 'how many' question, a focus on processes, and the flexible nature of qualitative research design helps inquire into this (Ritchie & Lewis, 2003).

3.1.1.4 Interpretive Case Study Design

To understand *how* technology influences processes of empowerment from the lenses of structure and power, I applied a case study research design. Merriam (1998) conceives qualitative case study as "an intensive, holistic description and analysis of a bounded phenomenon such as a program, an institution, a person, a process, or a social unit" (p. 11). A case study design is considered when the researcher wants to emphasise on the episodes of nuance, the sequential happenings of the context and the wholeness of the individual (Yazan, 2015). The primary characteristics of a case study are, firstly, emphasis is made on the interpretations of the subject-of-study's perceptions of a given phenomenon. Hence, the study is generally conducted within the natural environment of the subject. Second, the researcher adopts a holistic perspective when trying to explain *how* and *why* something happens. It thus becomes important to understand and identify the contextual factors that surround the unit of analysis and to develop a rich contextual account explaining the phenomenon. Third, case studies are generally qualitative and can be descriptive, exploratory, and/or explanatory, they can either be theory generating or making contributions to existing theory. Fourth, the researcher has no control on the events occurring in the context of the study. Finally, the researcher uses multiple data sources in the search for answering the questions (Grunbaum,

2007; Yin, 2003; Merriam, 1998). Following this, an important aspect of case study research is the unit of analysis (Grunbaum, 2007).

The unit of analysis is a central concept in understanding preparing and implementing a case study (Yin, 2003). Patton (2002) formulates it this way: “The key issue in selecting and making decisions about appropriate unit of analysis is to decide what it is you want to be able to say at the end of the study” (p. 229). A unit of analysis defines what the case is about i.e., an individual, a group, an organisation, a city etc (Grunbaum, 2007).

This thesis empirically centres around the case of empowerment the community health workers and the digitisation of their workflow processes within primary health care centres in India. The CHW forms the unit of analysis. The aim is to investigate the interaction with, and perception of the mHealth technology by the health worker. *Why the health worker?* As mentioned before, it is the health worker that is placed at the nexus of the community and the (state) governmental forms of health care. It is also the health worker who is the primary user of the mHealth intervention. Depending on the respective state health program, it is either the ASHA, ANM or AWW that uses the mHealth technology. mHealth studies from a health systems and practitioner’s point of view focus more on problematising the existing inefficiencies of the health system where technology is seen as solution to improve the workflow of CHWs to improve health outcomes (Modi et al., 2017; Agarwal et al., 2015; Braun et al., 2013). While mHealth research from an ICT4D perspective focuses more on the failure of technology to deliver its outcomes (Nyemba-Mudenda & Chigona, 2018; Sahay, 2016; Mukherjee, 2015). The focus then becomes to understand how and why technology leads to failure. However, both health systems and ICT4D research does not pay enough attention to the social outcomes that technology delivers for CHWs during their routine interaction with the technology and the empowering or disempowering impact it has on the CHWs. It is the health worker whose comfort and struggle with the technology in routine use, that plays a key role in understanding how a particular mHealth intervention is leading to an outcome, be it social or technical. My attempt is to create a bridge between health systems and ICT4D research to fulfil the existing gap surrounding technology and CHW research, within the developing country context.

The health worker as the unit of analysis was able to describe:

- how her workflow has been affected after the implementation of technology
- her perception of the functional features of the technology

- where she got constrained or enhanced during the routine use of the technology

It is the health worker's perception of, and interaction with a particular mHealth technology that is helping me understand which processes of technology-use are empowering and which are not.

3.1.2 Case Study: Community Health Workers and mHealth in India

3.1.2.1 Context of the Study

Overview of the macro-context of the study

The country of India occupies the greater part of South Asia. It is divided into 29 states (which are further subdivided into districts) and six union territories. Each state has its own elected government, while union territories are governed directly by the central government headquartered in the country's capital, New Delhi. The government of the country is a constitutional republic that represents a highly diverse population consisting of many ethnic groups and religious sects which include further sub-divisions of castes, tribes, and linguistic groups (Britannica, 2020).

India's Human Development index as per the 2018 UNDP report is 0.640, which places India at the position of 130 out of 189 countries and territories in the world. Between 1990 and 2017, India has shown improvement in the HDI value from 0.427 to 0.640 which is an increase of 49.8% (Figures cited from UNDP report, 2018). Consequently, India has also made gains within health in the past two decades. The country has shown decrease in the maternal, infant and child mortality rates through the advent of national health programmes such as the National Rural Health Mission or today known as the National Health Mission (NHM) (WHO, 2019). The NHM was launched by the government in 2013 to address the health needs of the under-served population of India. India has a rural population of 65.5% which is catered by district, community, and primary health care centres within the guidelines of the National Health Mission (Trading Economics, 2020). The first main reform of the NHM programme was to add the third cadre of health workers i.e., ASHAs to improve the existing community health worker program of the country. The second was to add various health schemes which provides financial incentives to pregnant women for institutional birth deliveries and immunisation of infants (Ministry of Health and Family Welfare, 2020; 2013).

Despite the reforms and gains, public health spending remains slow. Majority of the rural population and 80% in urban areas seek health care in the private sector, resulting in varying quality of care, rising rates of out-of-pocket health expenditures paid by families, and lack of access for those who cannot afford to pay (WHO, 2019). Consequently, at any point in time, an estimated 63 million people are still impoverished because of the catastrophic health expenditure (WHO, 2019). The lag in public health spending has also meant insufficient progress in many aspects of the population's health, including the still relatively high rates of childhood malnutrition, maternal mortality, tuberculosis, and malaria. In addition, an estimated of 350,000 children under five are still dying from health issues such as diarrhoea and pneumonia and almost a million children die in the first year of their life. This is compounded by great inequities in access to care and in health outcomes by geographical area and socioeconomic group; for instance, infant mortality rates by state ranged from 8 to 47 per 1000 live births in 2016 (Figures cited from WHO India report, 2019).

Thus, community health workers of India namely, ANMs, ASHAs and AWWs become key in creating health awareness, delivering health services, and linking rural communities to governmental forms of health care. CHWs also become key in addressing maternal and infant health issues such as referring pregnant women for institutional birth deliveries or promoting child immunisation during the routine house visits. Furthermore, the recent advent of public-private partnerships has enabled state governments to partner with local non-governmental organisations (NGOs) and private companies to introduce mHealth interventions to assist CHWs in their routine workflow.

Therefore, the data for this study was collected from 2 PHC centres in India, where mHealth interventions in the form of android tablets have been introduced through a public private partnership. More detail on the aspect of public private partnerships and the 2 PHC centres has been provided in the next sections.

Upon the request of my primary contacts at both PHC centres, I have maintained the anonymity of the names of all the interviewees, both the PHC centres and mHealth interventions. However, the names of the primary contacts themselves have been revealed. The primary data was collected from a PHC centre in the south of India and has been labelled as **PHC centre 1**. The supplementary data was acquired from a PHC centre in the north west of India and is labelled **PHC centre 2**. This has been depicted in the figure (3) below.

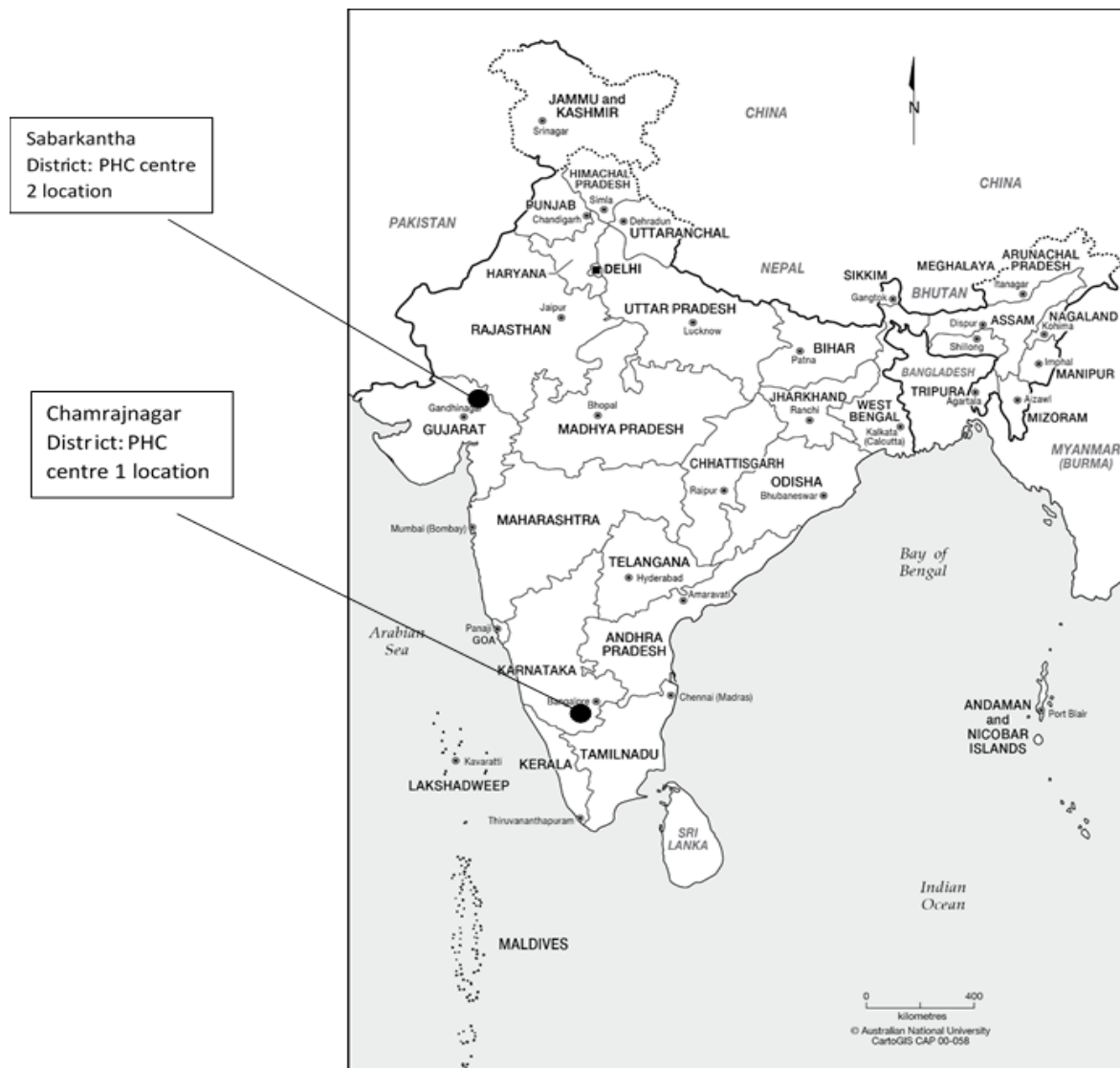


Figure (3) Map of India showing the location of the 2 research sites of the study.

Within the Indian context, there is no single mHealth intervention that has been universally implemented by the government and used in all the 23,391 PHC centres in the 29 Indian states (Sriram, 2018). While the MCTS (Mother and Child Tracking Software) is the *central government* mandated HIS (health information system) programme and is implemented in all Indian states. It is a standardised meta-level platform that centralises the data reported by the health workers either through an mHealth intervention (if it is being used in their district or PHC centre) or by directly visiting district hospitals to feed information collected in paper registers into the computers installed there (Gera, 2015). The mHealth interventions on the other hand, are generally implemented under the *respective state's vision and goal* of

healthcare and within the National Health Mission guidelines (Gopalakrishnan et al., 2020; Ilozumba et al., 2018; Prinja et al., 2016).

Therefore, mHealth interventions might be different in every state, as they are not managed by the centre. State governments generally partner with other private sector and/or non-governmental organisations to implement these initiatives under the PPP (public private partnership) model. For instance, within PHC centre 1, the mHealth app was implemented by a local NGO in collaboration with a private company for the main purpose of generating electronic health records (EHRs). However, within PHC centre 2, the mHealth app was launched in collaboration with a local NGO, external development agency and an educational institution for generating EHRs and becoming a medium of health information delivery (Razvi et al., 2016). While the management and upkeep of the mHealth tablets is handled by the local NGOs and private company partners, the data collected by the tablet is synced into the MCTS (HIS system) at the PHC centre for a centralised maintenance of health records by the government. Due to the complexity of the Indian health care system that includes both a centralised HIS system and a decentralised mHealth intervention system, the findings have been informed by two different PHC centres stationed in two different states. Even though the two PHC centres are stationed in different states, there are however several commonalities between the two centres, which are highlighted in table (3) on the next page.

The commonalities between the two research sites have helped pave an equitable ground to integrate the findings. I was able to corroborate several findings from the two sites to explain the supposed causal link between the technology intervention and claims of empowerment. Collecting data from two different research sites enabled me to replicate the findings and make them more robust. Data from PHC centre 2 especially helped me acquire retrospective validity in terms of the findings which I had collected from PHC centre 1. However, I would like to specify that as mHealth interventions are generally state specific and not centralised, the mHealth interventions investigated for this study, (while similar) are non-representative of other mHealth interventions and PHC centres in India. The data from both PHC centres was collected during the implementation stage of the mHealth intervention. The perspectives of various other participants involved in the phenomena have also been incorporated to provide a full explanation of the research issue. Lastly, the term *beneficiary* has been used to address the recipients of health care from the CHWs and PHC centre within the community. Beneficiaries mostly include maternal patients (pregnant women) and infants.

Table (3): Commonalities between the two research sites

Public	Private	mHealth app	Used by	Motivation for app development	Common Findings	PHC centre specific findings
Karnataka state government	Local NGO, Private Company	mHealth app Android tablet	ANM (senior health worker) assisted by the ASHA workers sometimes	<ul style="list-style-type: none"> Errors in the collected data Lag in data reporting Cumbersome task of collating data from different registers Poor communication between ANMs, ASHAs and supervisor at the PHC centre Poor management of emergency cases 	<ul style="list-style-type: none"> Streamlining of workflow processes Reduction in data error Reduction in time lag Enhanced accountability and monitoring of health worker Improved data communication between PHC staff and ANMs Lack of infrastructural support Duplication of data – tablet and register based data collection Reinforcement of hierarchies between ANMs and ASHAs ANMs feeling an increase in self-confidence 	Improvement in dealing with emergency cases
Gujarat state government	Local NGO, External Funding Agency, Educational Institution	mHealth app Android tablet	ANM (senior health worker) assisted by the ASHA workers sometimes	<ul style="list-style-type: none"> Errors in the collected data Lag in data reporting Cumbersome task of collating data from different paper registers Poor communication between ANMs, ASHAs and the supervisor at the PHC centre Poor management of emergency cases Poor quality health education interaction between ANMs and beneficiaries 	<ul style="list-style-type: none"> Streamlining of workflow processes Reduction in data error Reduction in time lag Enhanced accountability and monitoring of health worker Improved data communication between PHC staff and ANMs Lack of infrastructural support Duplication of data – using paper registers and tablet Reinforcement of hierarchies between the ASHAs and ANMs Feeling an increase in self confidence 	Enhancement in the health-related interaction between the ANMs and the beneficiaries

Overview of the micro context of the study

In this section I will explain the local context of the study as situated within the macro context of the Indian CHW and mHealth scene. Through the visual representation in figure (4) (put on the next page) I diagrammatically depict the local context. The figure has been adapted from Naik et al., 2020; Kaphle et al., 2015 and unnamed author.

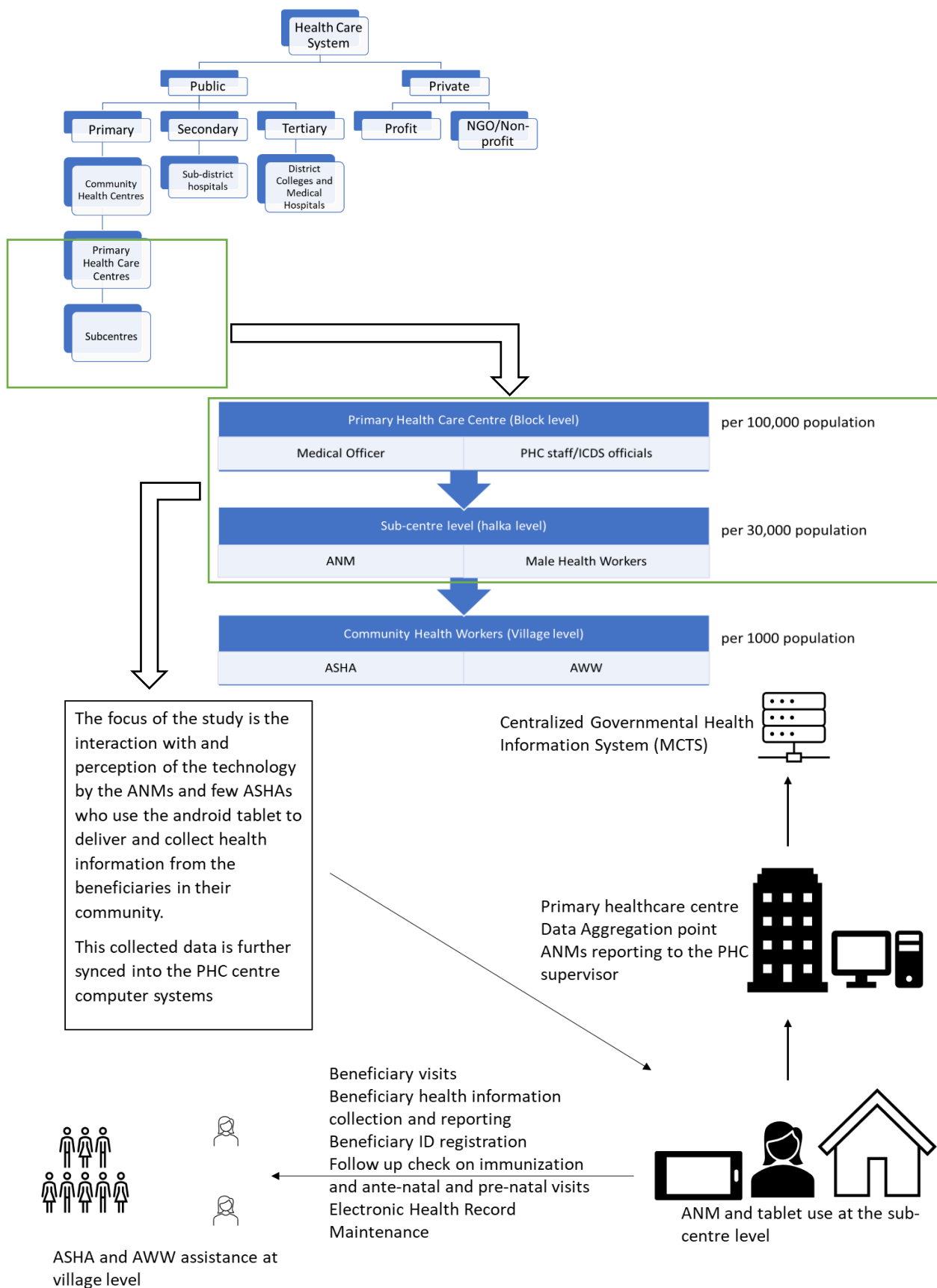


Figure (4) Micro-context of the study explaining the CHW link with the PHC centre and the community.

3.1.2.2 Primary Research Site: PHC centre 1

Chamrajnagar District

The Biligirirangana hills commonly known as BR hills, is a hill range situated at the confluence of the Western and Eastern ghats of southern India. It is located within the Chamrajnagar district of the southern state of Karnataka, India. It has a relatively high population of indigenous people and is one of the worse-off districts with respect to health and development (Seshadri et al., 2019). Most of the indigenous people in this district live in and around thickly forested and hilly areas, that are not typical of the most other regions in Karnataka. The hills are also a home to the Soliga tribal population of 23,000 individuals that have dwelled in the forests of BR hills for centuries. The population today is segregated into 9 tribal clusters called *podus* (Seshadri, 2019; Census of India, 2011).

Many PHC centres have adopted the public private partnership model to improve the delivery and management of health services to rural populations. In the case of PHC centre 1 situated at BR hills this was done with the help of a local NGO. The soliga population of BR hills are catered by **PHC centre 1** which is managed through a public private partnership model.

Public Private Partnership (PPP) model

A public-private partnership model in the health sector is seen as an instrument for governments to improve the efficiency, reliability, and availability of services in the health system. As a collaborative effort, the government body partners with a non-profit/voluntary organisation to achieve mutually understood and agreed upon objectives following certain mechanisms (Nayak, 2010). The purpose of the PPP model is to basically relieve the government of providing health services to rural population and share the workload with an NGO. One such initiative in India which has been prominent since the 1980s is the management of Primary Health Centres (PHCs) through PPP. Numerous Indian states like Orissa, Arunachal Pradesh, Gujarat, Karnataka, Himachal Pradesh etc., have adopted such models to manage their PHC centres (Prasanth, 2011; Nayak, 2010).

Established in 1986, the local NGO managing PHC centre 1, is a public charitable trust that has been implementing health and development programs through the public-private partnership model in India for over two decades. In accordance with the National Health

Mission guidelines, the NGO has been managing 26 public PHCs centres across 23 districts of the state of Karnataka. The NGO has constantly attempted to look out for ICT innovations, which help contribute towards a comprehensive primary healthcare approach. The success of PHC centre 1 over the years and its impact as a 'model PHC' have strengthened the idea of PPP (Karuna Trust, 2020). The success of this experiment led the Karnataka state government to issue a formal policy on public-private partnership in the year 2000 (Karuna Trust Annual Report, 2019-20).

The NGO provides PHC centre 1 with the required human resource and logistics to deliver preventive, promotive, curative, and rehabilitative health care services to the soliga population. To monitor community health and ensure institutional birth deliveries, the NGO employs health workers, namely ANMs, ASHAs and AWWS, to go on field visits, collect health information, reporting of health information to the PHC centre 1, perform ante-natal care (ANC) registration, educate expectant mothers, and follow up each patient throughout their pregnancy until delivery. The community health workers also engage in post-natal care and ensure that all under the age of 5 children complete all scheduled immunisations (Karuna Trust Annual Report, 2019-20, Seshadri et al., 2019).

I will next describe the roles and responsibilities of all the actors associated with the PHC centre 1.

Primary Health Care Centre 1

PHC centre 1 is located at the foothills of BR hills within the Chamrajnagar district. It consists of medical rooms, one medical officer, one supervisor, one dentist, one block health education officer, four staff nurses, one pharmacist, one laboratory technician, five ANMs, and two male health workers (MHWs). At the PHC centre, the soliga population are given medical services such as ENT treatments, pre- and post-natal care. Village health and nutrition days are also held such as – free eye clinic day, child nutrition day, maternal health day. People who are diagnosed with more serious diseases such typhoid, tuberculosis etc., are also treated through intensive health check-ups and medicines. The following people are associated with the PHC centre in delivering health services to the soliga population.

Medical Officer – is the primary medical doctor on duty and oversees treating patients and prescribing them with medicine.

Supervisor – The supervisor manages the CHW training and coordinates meetings with the health workers. The ANM directly reports with the updated health records of all the beneficiaries from the community to the supervisor. The supervisor also forms the liaison between the health workers and the medical officer.

CHW tier 1: ANMs (Auxiliary Nurse Midwives) - ANMs primarily function from the sub-centres. The sub-centre is a small village-level health centre which provides basic health advice and medicines to the community members. The sub-centre works under the Primary Health Centre (PHC). Each PHC centre usually has around 4-5 such sub-centres under it. Generally, one ANM is assigned per sub-centre. The ANM is usually from the local village and is provided with training. Her primary role is to conduct regular home visits for pre- and post-natal care and if required can treat simple ailments such as cold, flu, injuries etc. She also oversees maintaining of the health records of the village beneficiaries and reports to the supervisor at the PHC centre.

CHW tier 2: ASHAs (Accredited Social Health Activists) – Every ANM is assigned around 4-5 ASHA workers as a secondary resource for carrying out regular health home visits. The ASHAs workers do not receive any monetary compensation and are hired as volunteers. They do not receive any certified medical training. The ASHA worker assists the ANMs in the maintenance of the health records, providing basic medicines and assisting facilitating immunisation and institutional birth deliveries.

CHW tier 3: AWWs (Anganwadi worker) – Anganwadi workers primarily report to the ASHA. They take the role of local teachers and educate primary school children and lactating women on sanitation and hygiene. They mostly assist with the immunisation of the children under 5 within their area. Each ASHA has around 5-6 AWW workers reporting to them.

Village Health, Sanitation and Nutrition Committees (VHSNCs) - The committee is formed at the village level and acts as sub-committee of the local village government namely the Gram Panchayat. It includes elected members of the Panchayat, NGO members (if any) and the CHWs. The VHSNC meetings take place once a month where government health programs are discussed to create health awareness at the community level. The VHSNC is independent from the PHC centre and is allocated a fixed fund that is used to meet medical needs as per the outcome of the monthly meeting. Issues of community hygiene, nutrition and disease control are discussed and where possible mitigated with the help of the allotted fund at the village level.

mHealth intervention: android tablet

Despite the presence of the PHC system much of the rural population still suffered from acute chronic diseases and did not primarily depend on the PHC centre due to their existing faith in traditional medicine and health practices. Even with the involvement of the health workers who are chosen from the community itself, much of the population found it ‘inconvenient’ to travel to the PHC centre. It would cost 30 rupees (0.03 GBP) to go from the hills to the foothills to get medical treatment done. Hence ANMs and ASHAs become pivotal in providing this population with curative services and connecting them with the PHC centre. They conduct routine house visits and collect health information in paper-based registers and report it to the PHC centre every week. This equips the PHC centre with the health information from the community and enables them to monitor the community health. However, workflow of the ANMs was noted as having several issues:

- Errors in the recorded data
- Poor pre- and post-natal registration numbers
- Lag in reporting of the data to the PHC centre
- Cumbersome task of collating data from different registers
- Poor communication between ANMs, ASHAs and the supervisor at the PHC centre
- Poor response time to emergency care
- Poor health education communication between ANMs and beneficiaries (Naik et al., 2020)

The following causes of inefficiency paved the motivation to bring in a technology intervention. The public private partnership model invites a space for private software companies to collaborate with local NGOs to implement android tablets in the existing workflow processes of health workers (Karuna Trust Annual Report. 2019-20). An mHealth tablet was launched in the year 2015. I was able to collect the data in 2016, when the tablet was in its implementation stage.

The tablet aids the ANMs in the data collection and reporting of maternal and child health data of the beneficiaries from the community. The various functionalities afforded by the tablet are listed in table (4).

Technology feature	function
Storability and Retrievability	the aspect of the data being stored and retrieved at any given time/place
Interactivity and visualization	Smoother interface to input and view data
Multimediality	The aspect of being able to record, store and show videos
Connectivity	Mobile connectivity leading to linking with other devices
Automated analytics	automatic collation of the recorded data
GPS functionality and Reminder System	Geo-positioning
Reminder System	Constant provision of reminders to perform delegated task within a certain time frame

Table (4) mHealth tablet features 1

The tablet houses a plethora of specialised features relating to –

- Pre-natal care registration
- Post-natal care registration
- Childbirth registration
- Registration of child immunisation record up to the age of 5.

The mHealth intervention was primarily implemented to generate electronic health records and smoothen the data collection and reporting process of the ANMs.

3.1.2.3 Supplementary Research Site: PHC centre 2

Sabarkantha district

The Sabarkantha district is one of the 33 districts of the state of Gujarat of India and is in the north western part of the state. In 2006 the Ministry of Panchayati Raj named Sabarkantha one of the country's 250 most backward districts (out of a total of 640) (Census of India, 2011; Ministry of Panchayati Raj, 2009). It is one of the six districts in Gujarat currently receiving

funds from the Backward Regions Grant Fund Programme (BRGF) (Ministry of Panchayati Raj, 2009).

Like PHC centre 1, the PHC centre 2 is also supported by a medical officer, supervisor, nurses and ANMs which are responsible for providing antenatal care, assisting in institutional deliveries, providing basic emergency obstetric care and referral, postnatal care, and family-planning services in an area of 30,000 rural people. The ANMs are responsible for conducting house-visits for women beneficiaries, registering pregnant women, motivating them to obtain antenatal services, and perform institutional birth deliveries. Like PHC centre 1, maternal beneficiaries here too have access to ASHA and AWW workers. The ASHA sometimes assists the ANM in collecting data and maintaining the health records (Salazar et al., 2016; Razvi et al., 2016). The ANMs collect health information in paper-based registers and report it to the PHC centre every week. This equips the PHC centre with the health information from the community and enables them to monitor the community health. However, the workflow of the ANMs was noted as having similar issues as the PHC centre 1:

- Errors in the recorded data
- Poor pre- and post-natal registration numbers
- Lag in reporting of the data to the PHC centre
- Cumbersome task of collating data from different registers
- Poor communication between ANMs, ASHAs and the supervisor at the PHC centre
- Poor response time to emergency care
- Poor health education communication between ANMs and beneficiaries (Nagarajan, 2014)

While the Sabrakantha district has progressed, although slowly, towards the use of better healthcare in the last decade. However, lack of skilled staff, inadequate infrastructure, and poor monitoring have led to the under-use of the public-health system for delivery care (Razvi et al., 2016). PHC centre 2 implemented an mHealth intervention (android tablet) in collaboration with a local NGO, an external development agency and an educational institution. The tablet was developed to support ANMs to smoothen their data collection and reporting processes and to assist in the consistent delivery of health information to the beneficiaries (Mode, 2020; Nagarajan, 2014).

From a PHC staff point of view the use of the mHealth tablet helped in streamlining the workflow processes of the ANMs (Razvi et al., 2016). However, ANMs were noted as saying that the use of tablet also assisted them in improving their interaction with the beneficiaries at the individual and community level. The table (5) outlines the various functionalities afforded by the mHealth tablet at PHC centre 2.

Technology feature	Function
Storability and Retrievability	the aspect of the data being stored and retrieved at any given place and time
Interactivity and visualisation	Smoother interface to input and view data
Multimediality	The aspect of being able to record, store and show videos
Connectivity	Mobile connectivity leading to linking with other devices
Automated analytics	automatic collation of the recorded data
GPS functionality and Reminder System	Geo-positioning
Reminder System	Constant provision of reminders to perform delegated task within a certain time frame

Table (5) mHealth tablet features 2

3.1.2.4 Access

PHC centre 1

Access to PHC centre 1 was originally provided through Prof. Shirin Madon at the London School of Economics while I was doing my MPhil there back in 2016. She has a long-standing research association with the local NGO that is affiliated to PHC centre 1. I was able to get in touch with Doctor Tanya Seshadri, who is an independent medical researcher and has been professionally affiliated with the NGO for many years. She researches on the Chamrajnagar district PHC centres, alongside she has also been stationed as a medical officer at the PHC centre 1. She was able to arrange my stay at the guest house which is available for all researchers within BR hills and provided me with access to the ANMs using the mHealth intervention and the PHC staff. I stayed in BR hills for one month.

PHC centre 2

Access to PHC centre 2 data was provided through my affiliation as a research associate at the Centre or Management of Health Services (CMHS) under Prof. Rajesh Chandwani at the Indian Institute of Management, in Ahmedabad where I was employed as researcher for 7 months (March-September) in 2017. I worked on the mHealth project and was primarily involved in the data analysis and collection process. The transcribed data in conjunction with my PHC centre 1 data is being currently used on a research publication in collaboration with Prof. Chandwani (Pandey et al., working paper).

The data obtained from this centre was largely used to enhance and supplement my existing findings. It improved my understanding of the relationship between the ANM and mHealth intervention and was used to corroborate my existing findings, which were very similar to the Professor Chandwani's findings from the field. Out of the 3 PhD research papers, this data has been primarily used in the PhD paper 3. The aspect of the 'multimediality feature' of the tablet has been referenced to the PHC centre 2 findings.

3.1.2.5 Research Methods

A particular feature associated with case studies includes the use of multiple data collection methods (Flick, 2009; Ritchie & Lewis, 2003; Yin, 2003). To develop the case study, a mixture of semi-structured interviews and field observation was utilised. The concept of a 'mixed method' approach to research is often discussed in the context of combining qualitative and quantitative methods (Flick, 2009). But the same principles apply to using more than one qualitative method to carry out an investigation since each brings a particular kind of insight to the study.

The primary data collection was done in 2016 at the PHC centre 1 in the Chamrajnagar district, of the state of Karnataka for 1 month. Access to PHC centre 2 was established through the CMHS centre at the Indian Institute of Management where I was employed as a researcher from March 2017 – September 2017 (7 months). PHC centre 2 findings have been purely used to supplement my existing findings. Within qualitative research it is perfectly possible to supplement a sample within the scope of the study. "Unlike statistical enquiries where

information from newly drawn samples cannot easily be 'added' to an original data set unless the probabilities of selection of all the new and old sample cases are known, additional qualitative data can be quite reliably incorporated provided the same form of data collection has been conducted. This is because missing phenomena will add to the completion of the 'map' and frequency of occurrence is not of concern” (Ritchie & Lewis, p. 80). By corroborating my initial PHC 1 finding with the PHC centre 2 finding, helped me gain retrospective validity on the data that was collected from PHC centre 1.

Purposive sampling

For this research purposive sampling was applied. In this form of sampling the selection of participants, settings or other sampling units is based on a ‘purpose’ to represent a type in relation to the key criterion (Ritchie & Lewis, 2003). This enables the researcher to conduct a detailed exploration and understanding of the central themes and puzzles which the researcher wants to study (Flick, 2009). For this study, I wanted to ensure firstly, that all key constituencies of relevance to the subject matter are uncovered. Secondly, that some level of diversity is also included to get a rich understanding of the research issue, so I categorised participants based on their degree of interaction with the technology. My starting point was the tier 1 CHW i.e., ANM, as they are the primary users of the technology in both the centres. I then also interviewed a few ASHAs, as they assisted the ANMs every now and then. The PHC staff including supervisors and technology engineers were also interviewed to understand their rationale of mHealth use by health workers. In this respect, I had a representation of the whole universe of members surrounding the mHealth app within the PHC context.

Table (6) lists out the interviewees with the degree of interaction with the mHealth tablet.

Degree of Interaction with the technology	Interviewee	Total No. (Both centres)
High	ANM (CHW)	8
Intermediate	ASHA (CHW)	4
None	AWW (CHW)	1
Intermediate	PHC Supervisor	2
High	mHealth app Engineer	3
None	Beneficiaries	6

None	Community members	15
None	District Head	1
Total		40

Table (6) List of interview participants

All names have been anonymised.

Field Observation

I conducted field observation of the ANMs and few ASHAs to understand what their day-to-day processes are like. This helped me develop a rich picture of the context of the study and helped me create my interview topic guide. Ritchie and Lewis (2003) state that observation allows events, actions, and experiences to be seen through the eyes of the researcher often without any construction of those involved. Such a research technique is especially useful when investigating a process involving different players (Yin, 2003, p. 60). The intervention of mHealth within the existing workflow of the CHWs is used to achieve a specific outcome, in this case, maintaining electronic health records. Therefore, here I am examining the process to understand not only functional outcomes of the technology but also the socialised outcomes, if there are any. The field observation gave me an opportunity to observe and analyse behaviour and interactions as they occurred. Being just a plain observer also helped me gauge the behavioural nuances of different actors involved in the mHealth use. For instance, as PHC centres are official government health providers, some CHWs were hesitant to express negative feelings about the mHealth tablet to me, with the assumption that I might report them to the higher authorities. Hence, then just sitting and observing PHC centre meetings and meetings of the CHWs with the technology engineer gave me a better idea of how they really felt about the technology. For instance, when the aspect of the GPS feature was mentioned, I could sense disgruntlement amongst quite a few CHWs during the meeting. They were not happy that their completion of their weekly targets and whereabouts in the field could now be tracked by the PHC centre.

In the next table I outline some questions that guided me with the field observation.

General Field observation guide
How are the ANMs using technology?
How are the ANMs getting along with using the tablet?
What are the reactions of the ANMs about using the tablet?
How is the interaction between the ANMs and the engineers going?
How do the beneficiaries feel about the use of the tablet?
How does the PHC staff feel about the tablet?
How is the communication between the PHC staff and ANM managed?

Table (7) Sample field observation guide

Semi-structured Interviews

Interviews were conducted for the participants to develop their own account of what they perceive and feel about the technology in use. Grasping the personal account of the participant is seen as having central importance in social research because of the power of language to illuminate meaning. Sidney and Beatrice Webb (1932) described the method of the interview as being 'conversation with a purpose' (p. 130). As such, such a form of dialogue reproduces the basic process of normal human interaction in which knowledge about the social world is constructed (Kvale, 1996). For me, the interview process was like a form of normal conversation, where even during certain points of the observation process, I was just able to 'like a curious child' ask the ANM about something that I found intriguing in the moment. For instance, when one of the ANMs was conducting her house visits with the tablet, I was able to immediately jump in, to ask her about her relationship with the beneficiary and what she felt about it. To me this form of a dialogue helped establish a good rapport with the CHW. During the actual interview process, this good rapport played an important part in gaining a good understanding of the CHWs worldview. Kvale (1996) state that the interviewer journeys with the interviewee. That there is "a transformative element to the journey where the interviewer leads the subject to new insights and is also able to develop meaning of out of the interviewee's accounts" (pp. 3-4). I was able to, at certain points during the interview, probe on certain accounts more than the others. Conducting the field observation before, gave me a clearer insight about the points at which the ANM's interaction with the tablet was the strongest. For instance, when ANMs would use the tablet and registers to collate data, they would interact with different features of the tablet and talk about how cumbersome the process was. So, I was able to specifically highlight that aspect and ask them questions pertaining to it during the interview. The interviewer through the interview process should be able to obtain a deeper and

a fuller understanding of the participant's meaning. The semi-structured format also permits the researcher to explore fully all the factors that underpin participants' answers: reasons, feelings, opinions, and beliefs. This “furnishes the explanatory evidence that is an important element of qualitative research” (Ritchie & Lewis, 2003, p. 142). “The structure of the interview itself should be sufficiently flexible so as to allow different nuances to emerge from the conversation” (Ritchie & Lewis, 2003, p. 143). To achieve this, I first started with broad open-ended questions to understand what CHWs, PHC supervisors and community members generally feel about the technology and its impact on their workflow. Once the conversation had started, I slowly moved on to more specific questions where they could expand on their insights a bit more. I created a fixed guide of questions before going into the field, as outlined in table (8) below, which was based on my field observation, but eventually they served more as a reference than a fixed guide of questions. The questions slightly differed depending on how strongly associated with the technology the participant was (i.e., CHWs emphasised more on how they felt about using the technology, versus PHC staff who focused more on the efficiency aspect of the technology use from a managerial perspective). I also outline in table (9) the list of the interviewees, the duration of their interview, along with their pseudo names.

General Interview topic guide for PHC staff
<p><i>(broad)</i></p> <p>How do you feel about the ANMs at this centre?</p> <p>How do you feel about the community you cater to?</p> <p>Can you describe the routine processes at the PHC centre?</p> <p>How do you feel about the tablet that is being used by the ANMs?</p> <p>What changes has the use of the tablet brought at the PHC centre?</p> <p><i>(specific)</i></p> <p>Has the tablet created any changes in the data reporting process of the ANMs?</p> <p>Has the tablet created any changes in the data collection process of the ANMs?</p> <p>How has the use of the tablet impacted your communication with the ANMs?</p>
General Interview topic guide for CHWs
<p><i>(broad)</i></p> <p>For how long have you worked as an ANM?</p>

Do you like being an ANM?
What are your main responsibilities as an ANM?
What is your daily job like?
What are your feelings about using the health tablet?
 (specific)
Has the health tablet improved the data collecting process?
How did you do your job before you were given the health tablet?
How is the use of the health tablet different from the paper-based system?
How has the use of the health tablet affected your daily routine?
How has the use of the tablet affected your work process?
How has the use of the health tablet affected the relationship between you and the PHC staff?
Has the use of the tablet affected your input in the village committee meetings?
Has the use of the tablet created any major changes for you personally?
Overall, what is your opinion on the use of the health tablet?

Table (8) Sample interview topic guide

Interviewees	Pseudo-names	Interviewee time length
ANM 1	Jaya	01 hour: 2 minutes
ANM 2	Kiran	50 minutes: 20 seconds
ANM 3	Binita	01 hour: 15 minutes
ANM 4	Bhavna	01 hour
ANM 5	Bhagya	50 minutes: 19 seconds
ANM 6	Seema	45 minutes
ANM 7	Supriya	2 hours: 15minutes
ANM 8	Sarika	1 hour: 15 minutes
ASHA 1	Sanvi	30 minutes
ASHA 2	Yashti	30 minutes: 3 seconds
ASHA 3	Rajeshri	20 minutes: 2 seconds
ASHA 4	Vasudha	40 minutes: 13 seconds
AWW	Anjali	20 minutes
Supervisor 1	Nagendra	01 hour: 30 minutes
Supervisor 2	Mahesh	01 hour: 15 minutes
mHealth Engineer 1	Rohit	20 minutes: 18 seconds
mHealth Engineer 2	Anita	35 minutes: 30 seconds

mHealth Engineer 3	Yashpal	40 minutes: 20 seconds
District Head	Bhavin	01 hour: 05 minutes
Beneficiary 1	AaroHi	15 minutes: 34 seconds
Beneficiary 2	Hiral	13 minutes: 34 seconds
Beneficiary 3	Palak	25 minutes: 30 seconds
Beneficiary 4	Meenakshi	25 minutes: 56 seconds
Beneficiary 5	Rudrani	15 minutes: 30 seconds
Beneficiary 6	Urvi	20 minutes: 45 seconds
Village committee members		01 hour: 15 minutes

Table (9) List of interviewees along with their interview duration

According to Mishler (1986), when conducting interviews, the “critical issue is not the determination of one singular and absolute truth’ but the assessment of the relative plausibility of an interpretation when compared with other specific and potentially plausible alternative interpretations” (p. 112). This implies recognising the social and linguistic complexities of interviews as sources of bias (Alvesson & Mats, 2011). It was important to holistically recognise multiple interpretations surrounding the same technology use, specific to every participant. The interview dialogue gathered insights into members’ perceptions, rather than merely taking them as facts (Ritchie & Lewis, 2003). Therefore, it was important to recognise that, for instance, CHWs who directly interacted with the technology had a more critical outlook towards it. Their chances of struggling, exploring, or succeeding to use the technology were much more than the others because they were the primary users of the technology. Whereas PHC staff saw the technology in a more positive light, given their distance from it, and as simply a medium to enhance efficiency of the CHWs in their day-to-day work processes.

Translation

At the PHC centre 2, a translator was not needed as I spoke the local language. But at PHC centre 1, I did have a local community member who was escorting me and translating my conversations with the interviewees. The CHWs and the supervisor could understand some English, hence I could have some conversations with them directly. But the majority conversations were translated by the local who was accompanying me. I was also privileged to have the company of another independent researcher like me who had already stayed in the field for many months and was able to provide me with some other nuances from the field.

Field notes, images, and voice recordings

Historically, a central component of qualitative research has been “scratch notes” or the “field notes”. Originating from ethnographic anthropology, field notes are a researcher’s “private, personal thoughts, ideas, and queries regarding their research observations and interviews” (Phillippi & Lauderdale, 2018, p. 1). Field notes predominantly, help in constructing thick rich descriptions of the research setting, interview, and the unit of analysis. The notes situate qualitative studies within a larger societal and temporal context (Tong et al., 2007). They can be collected in a variety of formats including written, dictated and even visual sketches. “Taking field notes alongside an interview or observation can assist the memory of the researcher when working through the data” (Phillippi & Lauderdale, 2018, p. 3). Therefore adopting ‘an old school’ method I was constantly taking field notes to ‘jot’ down my thoughts, sometimes these included only certain words and phrases that would symbolise a certain meaning for me with respect to the context. These were also supplemented with images and video recordings from the field. These notes and images helped me during the analysis process to make sense of the data. Some images from the field have been shared in the next page:

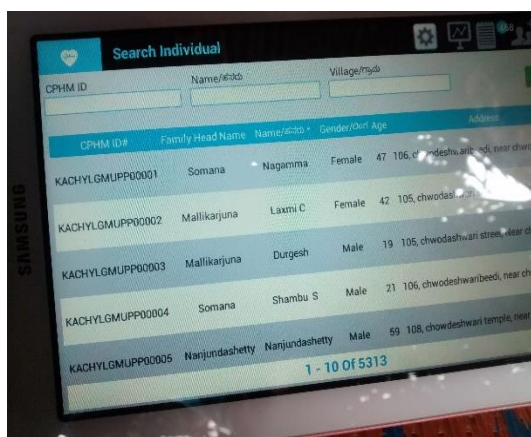


Figure (5) Snapshot of the beneficiary details in the tablet

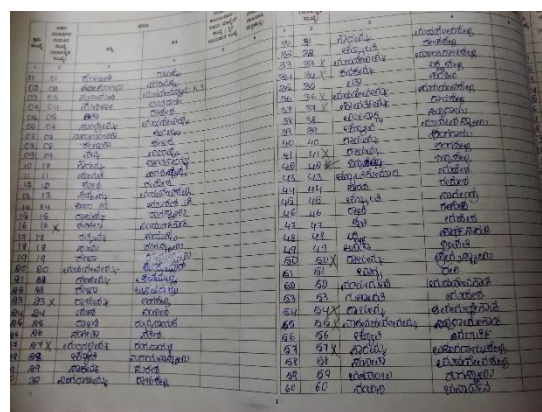


Figure (6) Snapshot of the register used by the ANMs



Figure (7) ANMs and Male Health Workers having a meeting with the engineers



Figure (8) ANM using the tablet and the register to cross-check data in both

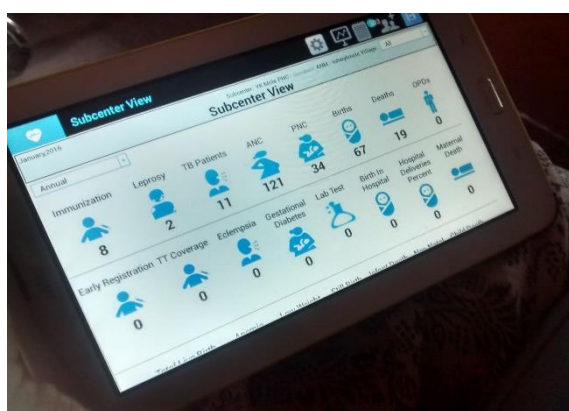


Figure (9) Snapshot of the different health registrations



Figure (10) ANM on her way to do the house visit

3.1.3 Data Analysis

My data analysis followed an abductive process where I constantly went back and forth between my empirical observations and theoretical constructs (Rinehart, 2009). During my field visit to PHC centre 1, I had multiple conversations around CHWs and their use of technology with Doctor Tanya. As she was my primary contact for the field visit, a medical health researcher herself, and had also been stationed at the PHC centre 1 as a medical officer, discussing my field findings with her gave me an insightful outlook towards the nuances of the social context of the CHWs. Similarly, during my employment at IIM-Ahmedabad, I was again able to discuss my findings in depth with Prof. Chandwani who is also a medical health and ICT4D researcher. As we both were and still are co-working on a research article on health workers and empowerment (Pandey et al., working paper), his outlook towards the Indian PHC system helped me better understand the nuances of the bureaucracy and constraints embedded within the PHC system. Finally, my theoretical clarity surrounding the empirical study emerged by oscillating between concepts of power, structure, and empowerment through in-depth conversations with my PhD supervisor.

I have followed an alternative thesis format for this PhD research, which involves the development of publications submitted to journals and conference proceedings. For the development of each publication, I reviewed existing literature to identify the gaps and develop themes around that, with the support of my empirical findings. Methodologically this meant that the data coding followed the same process for both the papers, but different theoretical perspectives guided the data analysis in each paper.

3.1.3.1 Coding Process

An abductive reasoning was adopted during the data analysis process. This helped me immerse in the routine workflow of the health worker while also allowing me to turn away from the task of scrutinizing evidence and being open to changing possibilities (Rinehart, 2020). There was constant back and forth between the empirical observations and the theoretical propositions that were finally adopted in this study. For instance, on the one hand empirical data was informing me about the social impact (unintended consequences) of technology on the health worker, but its theoretical relevance was grounded in understanding the changing power dynamics between the health workers and the PHC centre. Thus, the relevance of a social positioning lens emerged when the data revealed a change in the relations among the

CHWs, and between the CHWs and the PHC centre staff. Likewise, the concept of subjectivities was developed when the data, over time, started to show a dual effect of the mHealth intervention for the health worker. Wherein health workers were simultaneously feeling empowered but also further subjugated by the state's control during their routine use of the technology.

Thematic analysis was applied (Braun & Clarke, 2006) to analyse the interview transcripts. The technique also helped me capture the dominant theme that emerged from the data, which was the conceptualisation of empowerment and the simultaneous disempowerment of health workers. The phases of thematic analysis were strictly followed: familiarising with the data, generating initial codes, searching for themes, and developing analytical codes, reviewing themes, naming themes, and finally building the construct (Braun & Clarke, 2006).

The first step was to read the interview transcripts several times and take notes on key/constant topics. The field notes helped cross-reference the themes emerging from the data and helped understand the link between the health workers' accounts with the accounts given by the PHC staff. Transcription of the interviews was verbatim. The data was transcribed and coded before the writing of the papers began. The transcribed data was imported into NVivo (a software package designed to aid the analysis of the qualitative data) which facilitated the coding process. The codes created from NVivo were mainly created out of the interviewee's own descriptive words.

The analysis went through several cycles of coding and categorising. Initially a wide set of codes were identified. However, over time these codes were systematically grouped into more analytical codes. For instance, the analytical code of 'infrastructure issues' were collated directly from initial codes of 'poor electricity', 'hardware faults', 'lack of charging points'. However, the analytical code of 'accountability' emerged from different subsets of analytical codes which were grouped into 'surveillance' and 'process efficiency' which were collated from the initial codes. All initial codes were grouped under the same topic. Then as coding proceeded, more analytical codes were created, which were ultimately grouped into two predominant themes. The names of the analytical codes have been directly taken from the terms that were most used by the interviewees themselves. A snapshot of the coding process has been highlighted in figures (11) and (12) below and in the Appendix.

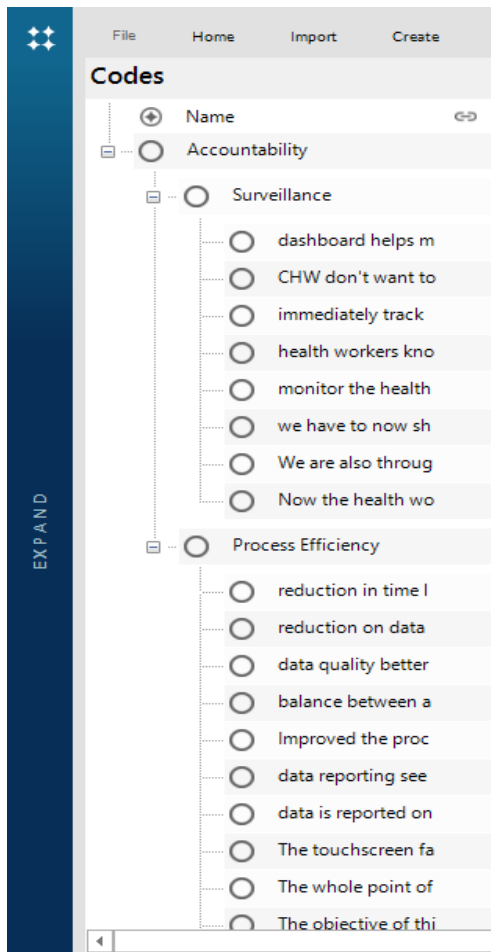


Figure (11) Snapshot 1 of the coding process

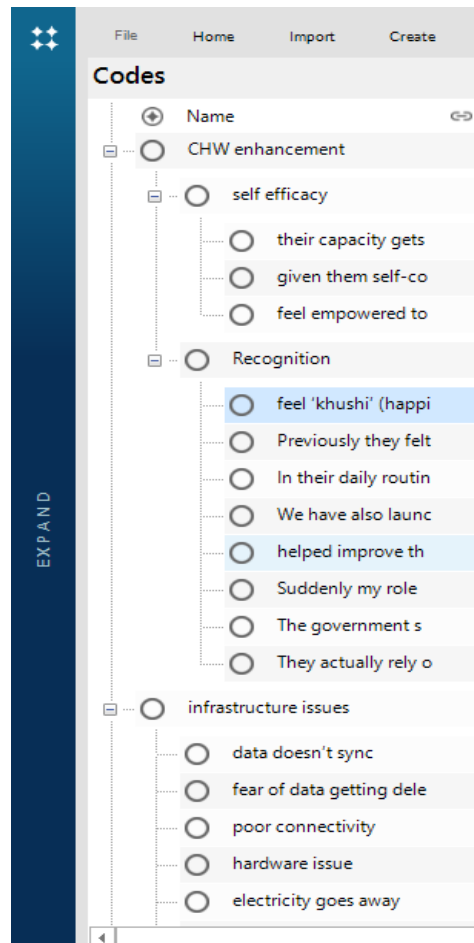


Figure (12) Snapshot 2 of the coding process

The two main themes which emerged from the empirical data were ‘feel good changes for the health worker’ or psychological empowerment of CHWs, along with ‘the reinforcement of the existing issues in the field for the health worker’ or the disempowerment of CHWs. Depending on the emergence of the various codes, I had to carefully integrate it with the respective theoretical lens in a way that best assisted me in answering the research questions.

For both my empirical papers, I constantly revisited the codes to see if the theoretical concepts of the paper covered them. All interviewees and both the mHealth apps and PHC centres have been made anonymous upon request of both my primary contacts. However, I have been open

about my primary contacts itself namely, Dr. Tanya Seshadri and Prof. Chandwani who strongly contributed to enriching my empirical understanding.

3.1.3.2 3 PhD Papers

The following subsections provide a summary of the data analysis process followed for every paper.

Paper 1: Unpacking Empowerment in ICT4D research

The first PhD paper is a pure literature review paper. The review critically highlights the existing gaps and inconsistencies between what empowerment means, the empowerment outcome and the technological outcome in the ICT4D literature. It discusses firstly, the importance of categorising different empowerment types along with its respective indicators. Secondly, it seeks to point researchers to refining the alignment between the technological outcome and empowerment outcome when studying ICT4D projects. Lastly, it also highlights the importance of using theories of power and structure to highlight empowerment and disempowerment of users within ICT4D projects. The highlighted gaps led to the motivation of the other two PhD papers.

Paper 2: Power, Empowerment and Technology: A Case of Community Health Workers in India

The second PhD paper emphasises the relevance of a power perspective to address the link between technology use and empowerment, which is currently understudied in IS and ICT4D literature. It sheds light on the ‘dialectical’ nature of the relationship between empowerment and technology. Technology enhances the (psychological) individual level capabilities of the health workers, but this enhancement occurs within the larger reproduction of power. The Foucauldian lens of power was adopted and the concept of technologies of the self was implemented to understand this aspect with a focus on human subjectivities of the CHWs during their use of an mHealth technology in their day-to-day work processes.

Paper 3: Who and Where of Affordance: A Case Study of mHealth and Community Health Workers in India

The 3rd PhD paper adopts the concept of social positioning from Giddens’ structuration theory and the socialised affordance lens to address the link between the social context and technology

use by human actors in everyday life. The motivation of this paper is to move from the existing narrative of seeing technology users as ‘users’ but to see them as human actors positioned at the intersection of various power structures, communication norms and knowledge significance. This can help researchers link outcomes of technology with the broader socio-structural context, instead of seeing the technology-user interaction in isolation. This has been supported empirically by studying the simultaneous, structural reinforcement and change of CHWs as mediated by technology in their everyday work practices.

3.1.4 Management of Ethics

Informed Consent

I follow The Social Research Association (SRA) Ethical Guidelines, published in 1980 and updated in 2003. The SRA recommends: “While social researchers operate within the value systems of their societies, they should attempt to uphold their professional integrity without fear or favour. They must also not engage or collude in selecting methods designed to produce misleading results, or in misrepresenting findings by commission or omission.” (Social Research Association 2002, p. 7). I received consent from Doctor Tanya Seshadri and Prof. Chandwani to refer and use the data collected from both the PHC centres. I started every interview by reminding the interviewee that the conversation was consensual, their identity was to remain anonymous, and they were free to terminate it at any time. I also requested their permission to record the interview. All the interviewees agreed to this. Where I used an interviewee’s quotes for the papers, I maintained confidentiality and did not share their name or the name of either of the NGOS, PHC centres and the mHealth interventions analysed in the study. To the best of my abilities, I attempted to ensure that no group was excluded from consideration in the interviews or field observation.

3.1.5 Reflexivity and Positionality

A researcher should constantly reflect on their actions and their role in the research process. Both the data and the research process should be subjected to critical scrutiny. This implies that as a researcher I should be aware of the position I hold through my choice of data collection methods. For instance, I should be aware of power relation between me and the interviewee

when the conducting interviews or observation, and to be reflective about how I am portraying the interviewee's perception in my research (Guillemin & Gillam, 2004).

I was not really perceived as an outsider in this context. I was a young Indian girl who had gone to the PHC centre to collect data. As PHC centre 1 has been awarded as the model PHC centre of India, it is used to receiving researchers from across the country and world. So, when I was observing and interviewing the participants, it was not a particularly new experience for them. I also made sure that I respected the rules and norms of the village. I generally wore traditional Indian clothes and when I was asked to stay in and not step out, I would stay in the guest house. I also socially spent time with some of the tribal women of the village and interacted with them as if I was their guest. This helped in establishing a friendly bond with the interviewees. However, there are different views with regards to how 'involved' must the researcher be. Walsham and Sahay (2005) consider that there is a potential risk when establishing strong connections with the research participants, that they would not be as open and honest in their responses. But Kvale states that (2006), "the qualitative research interview entails a hierarchical relationship, with an instrumental conversation. Hence in situations where trust has been created, there is a potential risk that the researcher conducts instrumental conversations, goes deep into the interviewees' private life and serves to efficiently obtain a disclosure of the interview subjects' world" (p. 482). I reflected on this and considered that it is important to maintain my relationship with the interviewees. I made strong efforts to ensure that even if I did have such conversations with anyone, these were not included or influenced the data that was collected.

Alternative thesis format

The final reflection I would like to share is in relation to the process of writing a thesis in an alternative format. The idea to write a thesis in an alternative format was decided soon after my upgrade. There have been great advantages and challenges of following this format. For example, going through the peer review process on the research papers have helped me shape my arguments and strengthen my work. This coupled with presenting my papers in different conferences and seminars and getting feedback from senior academics has helped me think of the weaknesses and the strengths, to find ways to improve my work and writing. However, I have also found that writing critically informed papers to address ICT4D research has not been an easy process. Especially as my thesis uses the lenses of power, empowerment and

affordances which are extremely contested notions in existing social and technology research. The empirical focus of the CHWs also created a challenging empirical analysis process, as CHWs and mHealth research has been heavily researched within the health systems, HIS, ICT4D and the medical research health domain. Hence, I had to familiarise myself with the literature across domains. Integrating the three PhD papers on power, structure, and empowerment into one coherent argument and then linking it with the broader research question of empowerment, has been part of a continuous reflective process. It has kept me constantly thinking on the benefits and the challenges of a thesis in the alternative format.

Conclusion

This chapter highlighted the research process and the epistemological perspective of the empirical study. The next section will showcase the three research papers that have formed this thesis.

Chapter 4

4. Three Research Papers

This chapter will display the three PhD papers that have formed this thesis.

4.1 Paper 1: Unpacking Empowerment in ICT4D Research

Pandey P., & Zheng Y. (2019). Unpacking Empowerment in ICT4D Research. In: Nielsen P., Kimaro H. (eds) Information and Communication Technologies for Development. Strengthening Southern-Driven Cooperation as a Catalyst for ICT4D. ICT4D 2019. IFIP Advances in Information and Communication Technology, vol 552. Springer, Cham.

4.2 Paper 2: Power, Empowerment and Technology: A Case of Community Health Workers in India

Pandey P., & Zheng Y. (Forthcoming). Power, Empowerment and Technology: A Case of Community Health Workers in India. In Proceedings of the IFIP 9.4 Joint Working Conference. The Future of Digital Work: The Challenge of Inequality, held on the 10th and 11th December 2020.

4.3 Paper 3: Who and Where of Affordance. A Case Study of mHealth and Community Health Workers in India

Pandey, P., & Zheng, Y. (under review). Who and Where of Affordance: A Case Study of mHealth and Community Health Workers in India. *Information Systems Journal*.

Chapter 5

5. Critical Evaluation

In this chapter, I will integrate the findings and the theoretical constructs to explain the refined link between technology and empowerment from a relational, processual and transformatory view of empowerment. I start this section by outlining the research questions. I then explain how the research questions along with the four gaps (highlighted in chapter 2) were fulfilled by outlining four propositions. The first proposition fulfils GAP 1 and 3. It explains how the definition of empowerment aligns with the outcomes of empowerment in this study. It also explains the value of specifying the specific empowerment type(s) and how that was achieved in this study. The second proposition fulfils part one of GAP 4 and accounts for the importance of a power perspective in addressing the aspect of change i.e., the transformatory potential of technology and the dialectical nature of empowerment. The third proposition fulfils part two of GAP 4 and accounts for the importance of a structure lens in addressing aspects of change and relationality of digital empowerment. The fourth proposition fulfils GAP 2 and illuminates the need for addressing digital empowerment both as a process and an outcome. This is followed by a theoretical integration of the constructs of power, structure and digital empowerment that explains how the broader research question was answered. This is followed by the empirical, epistemological, methodological, and other theoretical contributions to the IS and ICT4D literature.

5.1 Propositions for Digital Empowerment Research

Empowerment is a multifaceted concept. It is relational, transformatory and dialectical in nature and needs to be analysed at multiple levels i.e., individual, group and/or structural. This thesis has unpacked these very aspects by deconstructing the link between technology and empowerment.

My broad research question asked how technology is implicated in processes of empowerment. The two research sub-questions that helped me answer this question were:

- 1) How does technology mediate the relationship between capabilities of human actors and systems of domination and control?

- 2) how does the social positioning of human actors condition the outcome of technology?

Below I highlight the four propositions that integrate structure, power, and socialised affordances with digital empowerment to exhibit how the research questions were answered and gaps fulfilled. These propositions also form the theoretical contributions to existing ICT4D and empowerment research.

5.1.1 Adding specificity about the type of empowerment that takes place and to ensure its alignment with the definition of empowerment

This proposition addresses GAP 1: *Misalignment between the empowerment definition and the actual empowerment outcome* and Gap 3: *Lack of delineation of the specific empowerment type* and was fulfilled with the help of the lenses of power and structure.

Digital Empowerment in this study was defined as:

both the process, and the outcome of the process, by which people experience a gain in their individual capabilities by using digital technology. This should lead people to reflect and perceive themselves as able to act on their choices/beliefs, to transform those choices into actions and outcomes that are valuable to them.

The empowerment definition and the actual empowerment outcome in this study is aligned. Aspects of the empowerment process, outcome, change and the enhancement of capabilities as stated in the definition, are the very aspects that have been analysed in the findings as well. These have been explained in detail in the next three propositions.

The specification of the *empowerment type(s)* in this study was achieved through differentiating psychological (individual) empowerment from structural (systemic) empowerment. By doing this I was able to illuminate that while technology does lead to psychological empowerment of the CHWs, it is not enough to translate into structural empowerment for them. From this point of view, digital empowerment in this study is only occurring at an individual level, where CHWs feel a psychological change that they value, during their interaction with some of the affordances of technology. However, structurally

CHWs continue to feel disempowered because systemically there is no change taking place that is valuable for the CHWs i.e., they continue to remain overburdened and controlled by the PHC centre's demands. In other words, there is no change in their social or institutional status. The unevenness in the outcomes of technology is made visible with the help of the lenses of power and structure. They assist in unpacking the social context which includes structures of domination, legitimation and signification instantiated within power relations and processes. Structural conditions and systems of domination and control impact the social position and subjectivities of the CHWs which conditions their interaction with technology, culminating into different social outcomes for them.

5.1.2 To account for power processes of digital empowerment

This proposition addresses GAP 4: *Lack of theorisation of power*. It also answers the first research sub-question: *How does technology mediate the relationship between capabilities of human actors and systems of domination and control?*

A Foucauldian lens of power assisted me in recognising the aspect of change i.e., transformatory potential of technology and the dialectical nature of digital empowerment. This study has shown that while technology (psychologically) enhances the capabilities of the health worker, it does so, within the larger reproduction of power. Aspects of change (micro-level) and reproduction of (systemic) control and domination occur simultaneously.

According to Foucault (1988) power is capillary in nature, circulating everywhere and being sustained and circulated within the social body. As power penetrates more and more into our lives, it increasingly reproduces social practices and systemic inequalities within it (Hill, 2003). Thus, technology as implicated within social practices should also presumably become a medium of the continuation of systemic inequalities. But this is not the case every time. The intervention of technology within social practices does not always have a linear or positivist effect on human actors, where technology verbatim only reproduces existing practices without any change, at any level (Doolin, 2004; 1998). A technologies of the self, lens especially helps us unpack the changes in the individual capabilities and subjectivities of the CHWs despite the reproduction of power through technology. To put simply, even when macro-level systemic empowerment is not taking place, another type of empowerment is taking place i.e., psychological, or individual (micro-level) empowerment. Individual empowerment can help

technology users move one step closer towards their critical consciousness and add to enhancing their agency.

In this study, CHWs by virtue of their social role occupy a relatively elevated status in the community with respect to other women and men. The aspect of being selected as a CHW embodies a virtuous and moral role to selflessly serve the community. One could say that at an individual level, being chosen as a CHW is individually empowering. However, what succeeds it, is not empowering. The everyday work processes of health workers are plagued with several issues rendering them disempowered. In the Indian context, CHWs face many issues such as increase in workload, changing and overlapping health programs, limited autonomy to move around and execute responsibilities, poor training and incentivisation and the lack of credibility due to poor and inadequate knowledge corresponded by public blaming and shaming etc. (Som, 2016). Such issues have translated into a disempowered status of the CHWs.

Features of technology, such as GPS functionality, reminder systems, data entry culminated into giving outcomes of technology such as reinforcement of health worker hierarchies, overburden of workload and increased monitoring and surveillance. These outcomes render the CHWs as disempowered as before. Hence there is *no change* observed here. Technology has further reproduced existing processes of control and domination impacting the health worker. However, the multimedia and automatic collation features of technology culminated into outcomes such as improvement in the communication between the CHWs and the PHC centre and the community respectively, causing a psychological change for them. The enablement in the psychological capability of the CHWs has facilitated them in many ways during their routine work processes. Aspects of psychological empowerment help focus on the well-being aspect of human actors (Narayan, 2005). Pleasant emotions such as fulfilment, increase in self-efficacy, contentment help address people's positive evaluation of their life (Diener & Biswas Diener, 2005).

However, these psychological (internal) changes only enhance their agency at the level of the self. Due to the simultaneous reproduction of power by technology, there is still no external change taking place for them. Their status at the community and PHC level is still the same as before the intervention of technology. We could say that while the use of technology itself emerged into both empowering and disempowering processes, for example, increasing workload and communication improvement between the CHWs and the community, the outcome however was not truly empowering at a structural or systemic level. We see *no change*

taking place at a broader (macro) level around the role of the CHWs. There is a change only at the micro-level. But even a micro-level change can be an important steppingstone towards bigger changes for the CHWs over time, like an actual elevation in their status of being involved in the decision-making process at the PHC level, or increased incentivisation etc.

Addressing the aspect of power within technological process of empowerment highlights that empowerment can take place at multiple levels. Human actors embedded in power structures can experience a change (even if it is micro-level) during technology use.

5.1.3 To account for structural conditions of digital empowerment

This proposition address's part two of GAP 4: *Lack of theorisation of structure*. It also answers the second research sub-question: *How does the social positioning of human actors condition the outcome of technology?*

The accounting of structural conditions firstly, helped address the relational aspect of empowerment. Secondly, it helped in investigating the cause of uneven outcomes provided by technology, where technology is shown to give both intended outcomes and unintended (social) outcomes leading to a simultaneous empowering and disempowering effects for its users.

Structuration theory as a metatheory, and social positioning as a middle range concept helped delineate the range of possibilities and constraints available to human actors at different levels (individual, community or structural). These possibilities only exist meaningfully to human actors when there is a change in perception or action towards them from their social relations. One experience's empowerment (enablement) or disempowerment (constrained) in *relation* to someone else (Kabeer, 2005; Mason, 2005). Empowerment emerges from within the interaction human actors, groups or institutions have with one another. In my empirical study, the CHWs are placed in a network of many relationships which play out at multiple levels. They have a relation with the community for whom they are viewed as link with the PHC centre. Their relationship with the PHC system marks them by their identity and puts them in their institutional role of a health worker, and finally CHWs also hold a relationship with the other cadre of health workers. Their relations with the others in their network are maintained and governed by institutional rules and norms as embedded within structures of domination, legitimation, and signification. It is these rules and norms that give the PHC centre the authority

to control the roles and responsibilities of the health workers, which in turn also legitimises their (CHWs) social position of a ‘tool of data collection’ in their community.

The intervention of technology, from a top-down perspective then, also gets implicated within these structures of domination and legitimation and assists the PHC centre to reinforce control over the CHWs thereby also reinforcing their ‘tool of data collection’ social position. But technology also mediates structural relations. The emergence of unintended technological outcomes takes place once we account of the interplay between technology and the human actor as embedded in existing structural relations surrounding their social position. This position and its tethered relations condition technology to both constrain and enable human actors. In this study, the individual capabilities of the CHWs at the level of self were enabled. This (psychological) enablement of CHWs was in one sense, possible only because they felt a *change in the way their social relations were perceiving them*. CHWs started being perceived as an important ‘community link’ than as a ‘tool of data collection’ for the PHC centre and the community. The improvement in communication between the CHWs and the PHC staff and community was aided through technology. Technology plays a dual role of, a facilitator, and an inhibitor only because existing structural rules and norms, condition and precondition the technology to do so. Technology is preconditioned to control and monitor the health workers through the GPS and Reminder feature thereby reinforcing their perception as a ‘tool of data collection’. But technology also conditioned the improvement in the communication between the CHWs and their relations, which unintentionally started leading to a change in the perception of the CHWs as an important ‘community link’ thus making them feel enabled.

The recognition and acknowledgment of the rules and norms that govern social positions and relations at the intersection of domination, legitimation, and signification within a specific context, helps us understand how technology continues to reproduce social practices while also creating spaces for change. Technological/digital empowerment may be defined as technology’s ability to effect change for its users, but we cannot understand processes of digital empowerment without situating the user within a specific context and the relating socio-structural conditions that they reinforce, interpret, and mediate through their behaviour.

5.1.4 To account for both the process and outcome of digital empowerment

This proposition addresses GAP 2: *Lack of clarity in defining the empowerment concept as a process or an outcome*. This gap was fulfilled with the help of the socialised affordance lens. GAP 2 has been addressed after GAP 3 and 4 because this refinement in understanding empowerment, both as a process and outcome was made possible, only after acknowledging aspects of power and structure. Power and structure as embedded in the social context assist the socialised affordance lens in delineating empowerment processes from its outcomes.

Actions or activities conducted by human actors may be empowering or disempowering and the outcome of such processes result in a level of being empowered or disempowered (Barlett, 2004; Zimmerman & Rappaport, 1988). The same applies to digital empowerment. As mentioned in the previous propositions, technology as implicated in existing processes can give various outcomes, which may be constraining or enabling. Therefore, the process of using it can also translate into either an empowering or disempowering outcome for its user. In existing empowerment and development literature, a particular technological outcome is often, invariably assumed as technological empowerment, where provision of laptops to school children (Nugroho & Lonsdale, 2010) or implementation of telecentres (Alao et al., 2017) etc., is seen as directly empowering to its users. However, this is not the case at the ground level. A mere provision of access to technology does not necessarily lead to empowerment of individuals or communities. We need to adopt a deeper level of granularity to understand what aspect during technology use is empowering and how that leads to an empowering outcome (change) for the user.

The processes of using a technology and the subsequent outcome of those processes should be demarcated to make the claim of digital empowerment more refined. Outcomes (changes) and processes (mechanisms) of technology use, should not be seen as a homogenous whole but instead be delineated. A socialised affordance lens assisted me in demarcating various action possibilities of technology from its outcomes and helped address the relevance of the social context in the process of translation of the action possibilities into various outcomes. Thus, by mapping out, first, the functional affordances of technology, next its interplay with the socio-institutional norms and rules enveloping the human actor and then finally, its actualisation into outcomes, helped me recognise which aspects, during the enactment of technology, were enabling and constraining and how they translated into a change that was valuable to the human actor.

For instance, the intervention of technology in the existing context of the health workers helped translate certain disempowering aspects of their everyday work processes to psychologically empowering. Previously, the existing norm around the credibility of the health workers was poor. It would be questioned due to their poor and inadequate show of knowledge during their beneficiary/community interactions. They would be perceived badly by the community, making them (CHWs) feel demotivated and disempowered. However, with the intervention of technology, we could say that use of (functional affordances) multimedia affordances of technology (accessing and showing videos) and its intertwinement with the poor credibility of health workers, derived into an empowering process (or socialised affordance) for the health worker (improving interactions within the community). This ultimately translated into an outcome of psychological empowerment (feeling an increase in self-efficacy and confidence) for them. *Hence, both the process and outcome of the multimedia functionality has been empowering for the health worker.* Here I have been able to highlight the enmeshment of the functional affordance of technology with the institutional norm of the health worker to delineate the process-of-use and outcome of a specific feature of technology. This has helped me make a more refined claim of empowerment.

5.1.5 Integrating Power, Structure and Digital Empowerment

I will now integrate the four propositions to holistically address digital empowerment. My broader research question asked how is technology implicated in processes of empowerment? I was able to answer this question by placing relevance on the social context of technology. It is the social context that determines to what degree empowerment of an individual can take place. The social context consists of rules, norms, and resources at the intersection of domination, legitimation, and signification, that govern power relations and processes which are instantiated in social practices enacted by human actors (Kabeer, 2005; Narayan, 2005).

These very relations of power also govern the social position of human actors within their practices. Thus, it is a cyclical process and power and structure constantly reinforce and inform each other, where the strengthening of existing power processes leads to the continuation of structural reproduction and the weakening of existing power processes and relations opens spaces for change and vice versa (Hill, 2003; Doolin, 1998; Giddens, 1984; 1979). As depicted in figure (13) below, technology gets implicated in existing power processes and structural

conditions but also mediates the *social position* and *subjectivities* of the human actor. CHWs feel enabled when they feel powerful at a psychological level thus creating spaces for a micro-level change around their role. But they also simultaneously feel disempowered when existing structures of domination and control get strengthened. Both empowerment and disempowerment are being mediated through the enactment of various features of technology. The *delineation of technological affordances from its socialised outcomes* has assisted in understanding how the same technology has some features that materialise into strengthening existing forms of control while other features actualise into enhancement of capabilities for its users. Thus, the process and outcome of digital empowerment as mediated through technology is conditioned by the constant interplay of power and structure with human actors in each context.

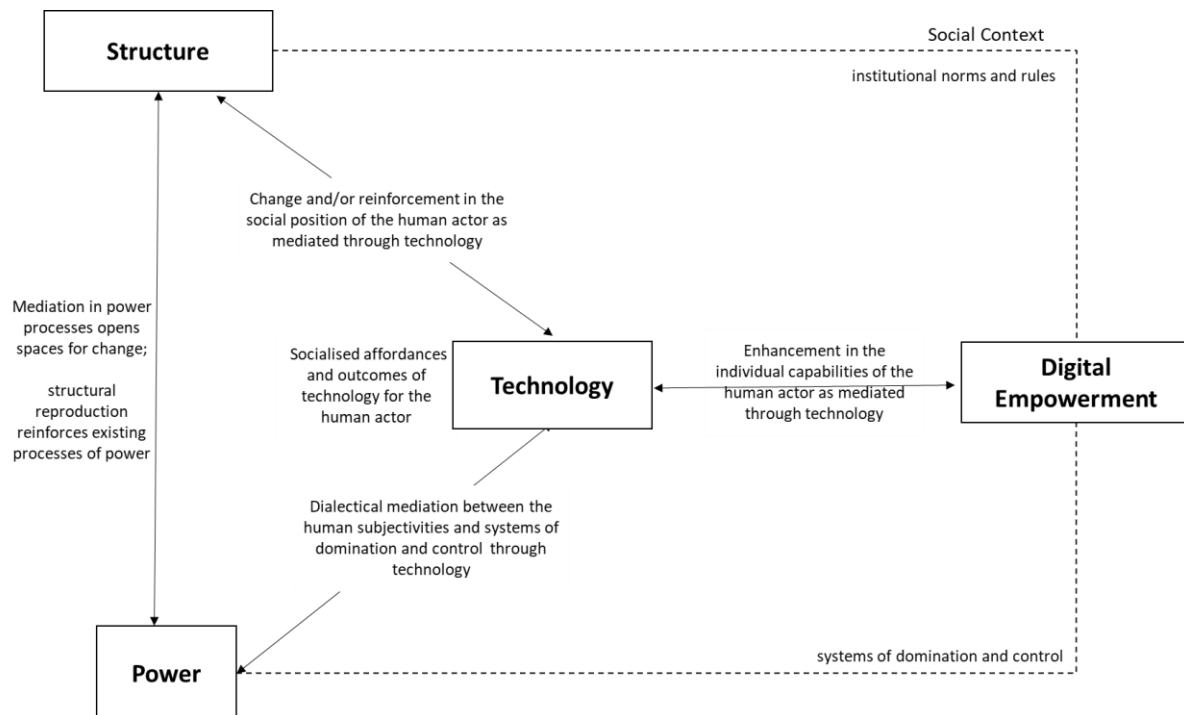


Figure (13) Addressing digital empowerment

To summarise, by addressing the constructs of power, structure, and the socialised outcomes of technology I was able to answer my broader research question. By mediating the subjectivities and social position of the human actor as situated within the structural conditions and power processes of the social context, technology gets implicated in the processes of empowerment.

Digital empowerment is not a fixed outcome, but a constant ongoing process which keeps changing depending on the social context. I would like to conclude by saying, that just by implementing technology in a context does not automatically mean its users will be empowered. One needs to unpack both the social context and the technological processes to understand how technology leads to empowerment, what kind of empowerment, and for whom.

5.2 Contributions

In addition to the above theoretical contributions, this research also contributes to existing ICT4D and empowerment research methodologically. Empowerment research within the development literature tends to largely focus on understanding the processes of empowerment through quantitative indicators within survey-based approaches (Narayan, 2005; Malhotra & Schuler, 2005). Developmental program evaluators tend to rely on their own judgements to what is of value, then to understand it from the recipients themselves as to what is empowering or disempowering for them (Kabeer, 2005; 2001, 1999). By adopting a qualitative research design, I was able to investigate the aspect of change that is valuable for people from their own retrospective narratives. Interviews and field observation helped me grasp the empowerment process as mediated through technology based on the technology users' own interpretations as situated within their local context. Aspects of psychological empowerment within existing power structures cannot be understood without a qualitative sense of what those changes mean to the disempowered (Malhotra & Schuler, 2005). Thus, a qualitative research design helps capture the subjective and transformatory nature of empowerment.

In the next sections I outline the epistemological, empirical, and other theoretical contributions for technology and structure, technology, and power, and ICT4D research.

5.2.1 Contribution to IS/ICT4D and Power research

A power perspective has helped me understand one of the prime paradoxes in the existing power and technology literature. Human actors constantly find themselves being further subjected to the organisational systems of domination and control while using technology (Marabelli & Galliers, 2017; Silva, 2007; Doolin, 2004) – yet many studies also show unintended consequences arising from technology use (Orlikowski, 2000; Orlikowski &

Robey, 1991). On the one hand, the human actor is subjected to reproduction of power, ascribing technology use to the norms and rules of the dominant rationale. On the other hand, technology can be perceived and used in an unanticipated manner due to various social factors or interpretive flexibility at an individual level (Doolin, 2004; Miller, 1987).

By addressing the relevance of power within the social context, I was able to develop a critical perspective towards understanding the relationship between technology and human actors (Doolin, 2004). A power perspective challenges the dominant and granted notions of the inherently progressive nature of technology and unpacks the ensemble of practices and techniques that define the use of the information technology and how it is implicated in the governance and subjectivity of human actors in given a context (Doolin, 1998; Bloomfield & McLean, 1996; Knights & Wilmott, 1989). I was able to attest, that technology does not cause or determine change but only ‘assumes’ it in a given context (Doolin, 2004; 1998; Bloomfield, 1995; 1991). As technology is implemented within a context, it also gets implicated in the existing social structures and power relations that form that context. Technology can only dialectically mediate the relationship between human actors and structures of domination. This dialectical mediation, however, can impact the various subjectivities that human actors enact in their social practices, which in turn can create spaces for change.

A perspective of technologies of the self, extends the existing technology and Foucault research, by bringing in a new dimension to confronting aspects of power surrounding technology use by human actors (Willcocks, 2004). Instead of adopting a traditional perspective on power, where the central aspect is placed on resisting or challenging the existing structures of oppression or control. My lens on power, unpacks how the everyday reproduction of power can affect the capabilities and subjectivities of human actors. It brings out the dialectical nature of the relationship between technology and human actors as situated in a context, where on the one hand individuals are able gain certain capabilities at the level of the self as mediated through technology. Contrariwise, this enhancement in the capabilities only takes place within the larger reproduction of power. Thus, in a way, technologies-of-the-self can help researchers’ study, the subjectification of the individual within the dominant discourse as mediated through technology, while also acknowledging the role technology plays in enabling individuals towards micro-level changes for themselves.

5.2.2 Contribution to IS/ICT4D and Structure research

A social positioning lens takes the existing technology and structuration research in IS and ICT4D, beyond the practice lens. The practice lens as proposed by Orlikowski (2000; 1992) draws upon Giddens (1984) duality of technology and structure to conceptualise how technological practices and structure reinforce each other. However, the practice view of technology hardly touches upon the positionality of actors within a social structure, which influences the power relations among different groups of actors thereby generating agential behaviour in relation to technology with different social outcomes. By bringing in the concept of social positioning from Giddens (1984), I was able to sensitise the research to a more sophisticated understanding of human actors as situated in large complex social structures. The social position is where the social structure enables and constrains human actors through the modalities of domination, signification, and legitimation (ibid.). By addressing the social position of actors, we can link the broader macro-structural layer with the micro level enactment of functional and socialised affordances through human actors at the ground level (Jones & Karsten, 2008).

A social positioning lens also helps sensitise researchers to actors' roles in sustaining or modifying settings, or, in other words, reproducing or changing structural rules and norms. Instead of privileging structure or agency, such a lens magnifies the delicate interconnections between social actors and social institutions. How human actors contribute to organisational and social power relationships, norms, meanings and how practices are shaped by these (Stones, 2005).

Next, by critically engaging with one of the under-explored tenets of Giddens's structuration theory I was able to bring to light, a new lens to help researchers further technology and structuration research, thus broadening the scope of existing research from its traditional focus on phenomena associated with computer-based information systems at the individual, group, and organisational levels, to address the broader institutional and social arrangements in which technology is increasingly implicated (which would also be more in line with Giddens's own position) (Jones & Karsten, 2008; Whittington, 1992). This gives a fuller appreciation of Giddens's structuration ideas. Aspects such as social positioning of human actors or resistance to change or an investigation of unacknowledged conditions and unintended consequences of

technology provides a more holistic understanding of structuration theory within technology research (Jones & Karsten, 2008).

Existing IS and structuration research has also been criticised for the lack of materiality of technology, where researchers investigate the social actions around technology but do not address the technical details of the technology (Rose et al., 2005; Rose & Lewis, 2001; Monteiro & Hanseth, 1996). Further, the lack of materiality also implicitly assumes that effects of material artefacts on social practices are wholly dependent on the knowledgeability of human actors. The assumption then, is that if actors are not knowledgeable about the functional use and effects of technology then the unintended consequences of technology cannot be explained with a possibility of technology's independent influence (enabling and constraining) on human actor's practices (Bernardi 2018; Jones & Karsten, 2008; Rose et al., 2005). In this research, by integrating structuration theory with a socialised affordance lens has helped address the materiality of technology. I was able to firstly, bring out the relevance of the specific functional features of technology and its use by human actors. However, an affordance lens which is socialised in nature, also highlights how the perception, and use of the various functional features of technology by the human actor is informed by the social context. Therefore, my empirical findings from the mHealth intervention suggest that on the one hand the functionality of technology does not fully determine how people will use a technology, at the same time, technology's potential uses are not fully open-ended due to its material limitations (Zheng & Yu, 2016).

Lastly, a structuration perspective within technology research adds value to the relevance of a qualitative research design. By focusing on the relationship between the human actor and the technology, as rooted in contextual factors paves a path to qualitative data collection and analysis methods. Interviews, observation, focus group interviews, thematic or narrative analysis help capture the nuances of human action and its perception of and interaction with technology as informed by socio-institutional settings (Orlikowski & Baroudi, 1991).

5.2.3 Contribution to IS/ICT4D and Affordance research

Existing technology and affordance research has been critiqued for the lack of addressing the relational aspect of technological affordances. The focus is generally at the level of the properties of technology and conceives affordances as embedded and directly perceived to be

enacted by the human actor (Markus & Silver, 2007; Zammuto et al., 2008; Leonardi, 2011; Pozzi et al., 2014). Such a view often implies a linear causality in the sequence of existence-perception-actualisation-effect and often strips the relational character of technological affordances (Bloomfield et al., 2010). The functional affordance concept leads to an analysis of technical features without sufficiently incorporating the enabling or inhibiting socio-structural factors that shape the perception, adoption, and outcome of technology (Zheng & Yu, 2016). This study, however, has addressed the true relational nature of affordances. By adopting a socialised affordance lens, I have been able to conceptualise a more useful interpretation to understand how people's practices and routine processes, shape but at the same time do not determine their use of technology. A socialised affordance becomes that bridging point where technology meets the social context enveloping the human actor. It considers the affordances of technology as shaped by the social, cultural, and institutional understanding of the artefact by the human actor. Further, by clearly mapping affordances from its specific functional features to different socialised affordances and then outcomes and likewise labelling them, accordingly, helps us understand that affordances of the same technology can be perceived and actualised differently by different user groups. Clearly defining the subsets of technology use namely, technology functions, affordances and outcomes helps lay the conceptual basis to unearth the processes of how technology leads to an outcome (Thapa & Hatakka, 2017).

Next, very few studies on technological affordances explicitly address the larger rules and norms of signification and domination. It is these aspects of an organisational context that shape the impact different human actors have on one another when using the same artefact. In this research, I integrate the socialised affordance lens with the social positioning lens. The integration of the two helps to address the social mechanisms affecting the relationship of human actors with each other while using an artefact. A socialised affordance(s) acts as a bridge between the social processes and technology, and becomes that theoretical lens, which when combined with other theories (e.g., structuration theory) helps form an important basis to provide explanations for organisational/institutional change associated with a specific technology (Volkoff & Strong, 2017; Strong et al., 2014). This enables a more holistic understanding of how a technology mediates changes for organisations or for human actors as situated within organisational rules and norms.

Lastly, a socialised affordance lens extends existing technology and affordance research epistemologically. While a pure functional affordance lens warrants a critical realist lens, where technology and reality are seen objectively (Fromm et al., 2020; Volkoff & Strong, 2017). Adopting a socialised affordance lens can help technology researchers delve into the social context and its impact on technology and human interaction, while maintaining the distinction between the social and the material (Zheng & Yu, 2016). Thus, paving the path for IS/ICT4D interpretivist researchers to contribute and expand affordance research.

5.2.4 Contribution to ICT4D research

Existing ICT4D research has been critiqued for not providing enough theoretical evidence to link findings from the field to socio-economic development (Sein et al., 2019; De et al., 2018; Walsham, 2017; Avgerou, 2017). Walsham (2017) states that “theory can be regarded as a key approach to the goal of generalisability, enabling the moving from a particular setting or application to more general statements or conceptual frameworks of potential value in understanding other contexts” (p. 7). In addition, Sein et al., (2019) advocate that an ICT4D researcher needs to go beyond purely providing descriptions of empirically observed events. An application of a social theory or theories can assist in explaining what causes patterns and is appropriate to the context to reach an accurate understanding of the phenomena investigated. Avgerou (2017) further states that researchers should adopt a combination of theories to extrapolate the social context of an IS phenomenon. Instead of purely focusing on the micro-settings of the situated practice where intra-actions and interactions of IT artefacts and human beings might occur, we need to also elaborate on the context beyond the situated practice.

In this study, theoretical guidance has been provided by a combination of both foundational and middle range theories. Structuration theory as a metatheory helps address the broader and enduring layers of the context that impact technology and the human actor. The concept of technologies-of-the-self offers a more localised and situated perspective of the effects of technology’s interaction with human actors. Lastly, socialised affordance as a middle range theory of technology, helps not only bridge the micro level changes of technology to the broader institutional context but also accounts for the materiality of technology. The combination of the above theories and concepts have enabled me with a critical and reflexive position towards this research. It has helped me trace the context by examining the relations of the entities and processes of the phenomenon (Avgerou, 2017). This has aided in formulating

and refining my research questions and empirical approaches with a thorough theoretical grounding.

This research also contributes to the transformative discourse of ICT4D research because it looks at the aspect of change (De et al., 2018; Avgerou, 2008). By adopting a processual view towards understanding change as mediated through technology in low-resource settings, I was able to critically evaluate the social reality under investigation. Both lenses on power and structure highlighted that change is not directly determined by technology. Instead (technological) processes of change are uneven. Technology both reinforces systemic inequalities but within it also causes spaces of change for human actors. Thus, the transformatory potential of any technology is dependent on how the structural conditions and power relations shape the interaction between technology and the human actor. This becomes an important starting point to understand how technology within a social context can/cannot enable or constrain change.

5.2.5 Empirical contribution

The empirical findings of this study align with many of the other mHealth studies done in India and other developing countries (Naik et al., 2020; Gopalakrishnan et al., 2020; Bassi et al., 2018; Ilozumba et al., 2018). Enhancement of CHW confidence and self-efficacy, increase in workload, and improvement in communication between the CHWs and the community have been reported by other CHW and mHealth studies. However, the theoretical apparatus used in this research, brings a new perspective to understanding the impact of technology on the workflow of CHWs. Providing relevance to the social context and the materiality of technology has highlighted the social outcomes that an mHealth technology furnishes for the CHWs. Making structural and power aspects visible has facilitated in revealing the dual effect of technology on CHWs, where the mHealth technology aids in improving the efficiency of healthcare management at the PHC level, but also impacts the role of community health workers structurally. In the process, health workers are empowered (increase in confidence and self-efficacy) and disempowered (reinforcement of domination and control) simultaneously. Thus, this research has extended existing mHealth research from centring around health outcomes or technology failure to highlighting the social and dual effect that technology has on the routine workflows of the CHWs.

In addition, highlighting these social outcomes of CHWs also points to the relevance of the CHW's perspective in mHealth research (Nyemba-Mudende & Chigona, 2018; Sahay, 2016; Chib et al., 2008). A CHW's perspective brought to light, how the enablement of capabilities mediated by technology brought a change for the health worker that was valuable to them. Health workers were able to attune to their socially responsible and altruistic role of serving their community. Technology was not designed with the purpose to mediate the subjectivity of the health worker, but it did. The recognition of this was only possible because processes and outcomes of technology were understood from their perspective i.e., the perspective of the user. Thus, addressing the social changes of the health worker from the health workers perspective has shed a new light on mHealth and community health worker research. Such a perspective can assist practitioners and policy implementers in understanding the relevance of training, incentivising, and enhancing CHWs. Because CHWs become pivotal in, not only collecting and reporting data from the community but also in becoming an important link with the community that can assist the community in realising the potential of formal health care.

While this study was completed over the course of a few months, for future research it would be even more beneficial if a longitudinal a study would be conducted to observe if there is any (systemic) structural change in the long term e.g., if the health workers become formally included in meetings or decision-making process at the PHC level or if policy changes around health worker's role occur. This would also help map out processes of transformative change as mediated through technology for the CHWs.

5.2.6 Epistemological contribution

The call for interpretive research to be critical has been advocated by many IS theorists (De et al., 2018; Zheng & Stahl, 2011; Stahl, 2008; Avgerou, 2008; Doolin & McLeod, 2006; Walsham & Sahay, 2006). It relies on three elements namely, insight, critique, and transformation (De et al., 2018; Cecez-Kecmanovic, 2011; Myer & Klein, 2011; Alvesson & Deetz, 2000). Insight is achieved by understanding the social and power relations of human actors as situated in their social reality. Critique is a deeper form of insight that goes beyond what is visible to uncover hidden workings of power. Third, insight and critique should also entail an understanding of change or transformation (De et al., 2018). While I do not necessarily implement critical theory in this research, by adopting Foucault's relational view of power in

conjunction with Giddens's structuration theory, I was able to encapsulate the above three elements.

Structuration theory addresses the duality of technology as simultaneously enabling and constraining human actors. It frames the research in a manner that helps interpret the relation between context and processes associated with a technology. A Foucauldian power perspective confronts issues of power and questions the status quo in organisational and technological change. It deconstructs technology as a condition and a consequence of a broader set of social and political relations. Both theories have provided *critical insight* through their relational view towards social life, thereby integrating societal contexts and processes with technological practices. Finally, by bringing out the dialectical relationship between human actors and the wider socio-institutional structures of domination, these theories also address aspects of technological *change*. A critical perspective negates an unreflective treatment towards technology which maintains taken-for-granted assumptions about technology and encourages its reification. Both structuration theory and the Foucauldian analytics of power, support interpretive technology researchers in developing a critical and reflective stance as they research a technological phenomenon, even when they are not applying critical theory.

6. Bibliography

Agarwal, S., Perry, H., Long, L., & Labrique, A. (2015). Evidence on feasibility and effective use of mHealth strategies by frontline health workers in developing countries: systematic review. *Tropical Medicine & International Health*, 20(8), 1003-1014.

Alao, A., Lwoga, T., & Chigona, W. (2017). Telecentres Use in Rural Communities and Women Empowerment: Case of Western Cape. In *14th International Conference on Social Implications of Computers in Developing Countries (ICT4D)*. Yogyakarta, Indonesia.

Alkire, S. (2005). Subjective Quantitative Studies of Human Agency. *Social Indicators Research*, 74(1), 217-260.

Alsop, R., & Heinsohn, N. (2005). *Measuring empowerment in practice*. World Bank, Poverty Reduction and Economic Management Network, Poverty Reduction Group.

Alsop, R., Bertelsen, M., & Holland, J. (2006). *Empowerment in practice*. World Bank.

Alvesson, M. & Mats. (2011). *Interpreting interviews*. London: Publication Ltd.

- Alvesson, M., & Deetz, S. (2000). *Doing critical management research* (pp. 139-165). SAGE Publications Ltd.
- Andersson, A., & Hatakka, M. (2010). Increasing Interactivity in Distance Educations: Case Studies Bangladesh and Sri Lanka. *Information Technology for Development*, 16(1), 16-33.
- Archer, M. (1990). Human Agency and Social Structure: A Critique of Giddens in *Anthony Giddens: Consensus and Controversy*, J. Clark, C. Modgil, and J. Modgil (eds.). Brighton, UK: Falmer Press, 73-84.
- Archer, M. (1995). *Realist Social Theory: The Morphogenetic Approach*, Cambridge, UK: Cambridge University Press.
- Ashforth, B., Sluss, D., & Saks, A. (2007). Socialization tactics, proactive behavior, and newcomer learning: Integrating socialization models. *Journal Of Vocational Behavior*, 70(3), 447-462.
- Ashton-Shaeffer, C. J., Gibson, H. E., Autry, C. S., & Hanson, C. (2001). Meaning of sport to adults with physical disabilities: A disability sport camp experience. *Sociology of Sport Journal*, 18(1), 95-114.
- Avgerou, C. (2008). Information Systems in Developing Countries: A Critical Research Review. *Journal of Information Technology*, 23(3), 133-146.
- Avgerou, C. (2017). Theoretical Framing of ICT4D Research. In *14th International Conference on Social Implications of Computers in Developing Countries (ICT4D)*. Yogyakarta, Indonesia.
- Avgerou, C., & McGrath, K. (2007). Power, Rationality, and the Art of Living through Socio-Technical Change. *MIS Quarterly* 31(2), 295-315.
- Azad, B., & Faraj, S. (2011). Social power and information technology implementation: A contentious framing lens. *Information Systems Journal* 21(1), 33-61.
- Baber, Z. (1991). Beyond the Structure/Agency Dualism: An Evaluation of Giddens' Theory of Structuration. *Sociological Inquiry*, 61(2), 219-230.
- Bailur, S., Masiero, S., & Tacchi, J. (2018). Gender, mobile, and development: The theory and practice of empowerment. Introduction. *Information Technologies & International Development* (Special Section), 14, 96-104.
- Bajpai N., & Dholakia RH. (2011). Improving the performance of accredited social health activists in India. Working Papers. Mumbai, India: Columbia Global Centres South Asia.
- Bakardjieva, M., & Gaden, G. (2012). Web 2.0 Technologies of the Self. *Philosophy & Technology*, 25(3), 399-41

- Banks, S. P., & Riley, P. (1993). Structuration Theory as an Ontology for Communication Research. *Communication Yearbook* (16), 167-196.
- Barbalet, J. M. (1987). Power, Structural Resources and Agency. *Current Perspectives in Social Theory*, (8), 1-24.
- Barlett, A. (2004). *Entry Points for Empowerment*. CARE Bangladesh.
- Barley, S. R. (1986). Technology as an Occasion for Structuring: Evidence from Observation of CT Scanners and the Social Order of Radiology Departments. *Administrative Science Quarterly* 31(1), 78-108.
- Bartlett, A. (2004). Entry points for empowerment. CARE Bangladesh. UK: Department of International Development.
- Bassi, A., John, O., Praveen, D., Maulik, P., Panda, R., & Jha, V. (2018). Current Status and Future Directions of mHealth Interventions for Health System Strengthening in India: Systematic Review. *JMIR Mhealth And Uhealth*, 6(10), e11440.
- Batliwala, S. (1994). The Meaning of Women's Empowerment: New Concepts from Action. In G. Sen, A. Germain and L. C. Chen *Population Policies Reconsidered: Health, Empowerment and Rights*. Cambridge, MA: Harvard University Press.
- Bernardi, R. (2018). Health Information Systems and Accountability in Kenya: A Structuration Theory Perspective. *Journal of The Association for Information Systems*, 18(12), 931-958.
- Bernardi, R., Sarker, S., & Sahay, S. (2019). The Role of Affordances in the Deinstitutionalization of a Dysfunctional Health Management Information System in Kenya: An Identity Work Perspective. *MIS Quarterly*, 43(4), 1177-1200.
- Bernhard, E., Recker, J.C. & Burton-Jones, A. (2013). Understanding the Actualization of Affordances: A Study in the Process Modelling Context. In *Proceedings of the 34th International Conference on Information Systems*, Milan, Italy.
- Best, S. (1994). Foucault, postmodernism, and social theory, in D. Dickens and R. Fontana (eds), *Postmodernism and Social Enquiry*. London: UCL Press.
- Bhowmick, S. (2015). Structural explication of technology adoption In ICT4D: a throwback to Giddens. In: *ICTs in Developing Countries: Research, Practices and Policy Implications*. Palgrave Macmillan, Basingstoke, 25-38.
- Bloomfield, B. P., Latham, Y., & Vurdubakis, T. (2010). Bodies, technologies, and action possibilities: When is an affordance? *Sociology*, 44(3), 415-433.

- Bloomfield, B.P. (1991). The role of information systems in the UK National Health Service: action at a distance and the fetish of calculation. *Social Studies of Science*, 21, 701–734.
- Bloomfield, B.P. (1995). Power, machines, and social relations: delegating to information technology in the National Health Service. *Organization*, 2, 489–518.
- Bloomfield, B.P., & Coombs, R. (1992). Information technology, control, and power: the centralization and decentralization debate revisited. *Journal of Management Studies*, 29, 459–484.
- Bloomfield, B.P., & McLean, C. (1996). Madness and organization: informed management and empowerment, in Orlikowski, W.J., Walsham, G., Jones, M.R. and Degross, J.I. (eds) *Information Technology and Changes in Organizational Work*. London: Chapman and Hall, 371-393.
- Boillat, T., Lienhard, K. & Legner, C. (2015). Entering the World of Individual Routines: The Affordances of Mobile Applications. *Proceedings of the Thirty-sixth International Conference on Information Systems*, Fort Worth, 2015, 1-18.
- Bonnell, S., Griggs, A., Avila, G., Mack, J., Bush, R., Vignato, J., & Connelly, C. (2017). Community Health Workers and Use of mHealth: Improving Identification of Pregnancy Complications and Access to Care in the Dominican Republic. *Health Promotion Practice*, 19(3), 331-340.
- Boudreau, M., & Robey, D. (2005) Enacting Integrated Information Technology: A Human Agency Perspective. *Organization Science*, 16, 3-18.
- Braun, R., Catalani, C., Wimbush J., & Israelski, D. (2013). Community Health Workers and Mobile Technology: A Systematic Review of the Literature. *PLoS ONE*, 8(6).
- Brooke, C. (2002a). What does it mean to be ‘critical’ in IS research? *Journal of Information Technology*, 17(2), 49–58.
- Brooke, C. (2002b). Critical perspectives on information systems: An impression of the research landscape. *Journal of Information Technology*, 17(4), 271–85.
- Brooks, L. (1997). Structuration theory and new technology: analysing organizationally situated computer-aided design (CAD). *Information Systems Journal*, 7(2), 133-151.
- Brown, H., & Green, M. (2015). At the service of community development: the professionalization of volunteer work in Kenya and Tanzania. *African Studies Review*, 58. 63–84.
- Busco, C. (2009). Giddens’ structuration theory and its implications for management accounting research. *Journal of Management & Governance*, 13(3), 249-260.
- Buskens, I. (2011). The Importance of Intent: Reflecting on Open Development for Women’s Empowerment. *Information Technologies and International Development*. 7(1), 71-76.

- Bygstad, B., Munkvold, B. E., & Volkoff, O. (2016). Identifying generative mechanisms through affordances: A framework for critical realist data analysis. *Journal of Information Technology*, 31(1), 83–96.
- Callinicos, A. (1985). Anthony Giddens: A Contemporary Critique. *Theory and Society* 14(2), 133-166.
- Callon, M. (1986). Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of Saint Brieuc Bay, in *Power, Action and Belief: A New Sociology of Knowledge*. J. Law (ed.). London: Routledge and Kegan Paul, 196-229.
- Carmichael, S., Mehta, K., Srikantiah, S., Mahapatra, T., Chaudhuri, I., & Balakrishnan, R. (2019). Use of mobile technology by frontline health workers to promote reproductive, maternal, newborn and child health and nutrition: a cluster randomized controlled Trial in Bihar, India. *Journal of Global Health*, 9(2).
- Cecez-Kecmanovic, D. (2011). Doing critical information systems research – arguments for a critical research methodology. *European Journal of Information Systems*, 20(4), 440-455.
- Chan, T. K., Cheung, C. M. & Wong, R. Y. (2019). Cyberbullying on Social Networking Sites: The Crime Opportunity and Affordance Perspectives. *Journal of Management Information Systems*, 36(2), 574–609.
- Chapman, G. E. (1997). Making weight: Lightweight rowing, technologies of power, and technologies of the self. *Sociology of Sport Journal*, 14(3), 205-223.
- Chemero, A. (2003). An outline of a theory of affordances. *Ecological Psychology*, 15(2), 181–195.
- Chew, H., Ilavarasan, V., & Levy, M. (2013). Mattering Matters: Agency, Empowerment, and Mobile Phone Use by Female Microentrepreneurs. *Information Technology for Development*, 21(4), 523-542.
- Chib, A., Lwin, M., Ang, J., Lin, H., & Santoso, F. (2008). Midwives and mobiles: using ICTs to improve healthcare in Aceh Besar, Indonesia. *Asian Journal of Communication*, 18(4), 348-364.
- Chigona, W., Nyemba, M., & Metfula, A. (2012). A review on mHealth research in developing countries. *The Journal of Community Informatics*, 9(2).
- Chilundo, B., & Aanestad, M. (2004). Negotiating Multiple Rationalities in the Process of Integrating the Information Systems of Disease-Specific Health Programmes. *The Electronic Journal of Information Systems in Developing Countries*, 20(1), 1-28.
- Chu, C., & Smithson, S. (2007). E-business and organizational change: a structurational approach. *Information Systems Journal*, 17(4).

- Clegg, S. (1998). Foucault, power, and organizations. In A. McKinlay., K. Starkey (eds), *Foucault, Management and Organization Theory*. London: Sage Publications.
- Clegg, S.R. (1989). *Frameworks of Power*. Sage, London.
- Cohen, I. (1989). *Structuration Theory: Anthony Giddens and the Constitution of Social Life*. Basingstoke, UK: Macmillan.
- Corbett, J., & Keller, P. (2004). Empowerment and Participatory Geographic Information and Multimedia Systems: Observations from Two Communities in Indonesia. *Information Technologies and International Development*, 2(2), 25-44.
- Costall, A. (1995) Socializing Affordances. *Theory & Psychology*, 5, 467-481.
- Costall, A. (2012). Canonical affordances in context. *Avant: Trends in Interdisciplinary Studies*, 3(2), 85-93.
- Costall, A., & Morris, P. (2015). The “textbook Gibson”: The assimilation of dissidence. *History of Psychology*, 18(1), 1-14.
- Crabtree, B.F., & Miller, W.L. (1999). *Doing Qualitative Research*, London: Sage.
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Thousand Oaks, CA: Sage.
- Crotty, M. (1998). *The Foundations of Social Research: Meaning and Perspective*. Sage: London.
- Davies, L., & Mitchell, G. (1994). The dual nature of the impact of IT on organizational transformations, in R. Baskerville, S. Smithson, O. Ngwenyama and J. DeGross (eds), *Transforming Organizations with Information Technology*. Amsterdam: North-Holland.
- Davis, S. (2008). Empowering Women Weavers? The Internet in Rural Morocco. *Information Technologies and International Development*, 4(2), 17-23.
- De', R., & Ratan, A. (2009). Whose gain is it anyway? Structural perspectives on deploying ICTs for development in India's microfinance sector. *Information Technology for Development*, 15(4), 259-282.
- De', R., Pal, A., Sethi, R., Reddy, S., & Chitre, C. (2018). ICT4D research: a call for a strong critical approach. *Information Technology for Development*, 24(1), 63-94.
- Deacon, R. (2002). An analytics of power relations: Foucault on the history of discipline. *History of the Human Sciences*, 15(1), 89-117.

- Denzin, N., & Lincoln, Y. (2005). *The SAGE handbook of qualitative research*. Thousand Oaks: Sage Publications.
- DeSanctis, G., & Poole, M. S. (1994). Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory. *Organisation Science*, 5(2), 121–147.
- Diener, E., & Diener, R. (2005). Psychological Empowerment and Subjective Well-Being. In D. Narayan, *Measuring Empowerment: Cross Disciplinary Perspectives* (pp. 125-141). World Bank. Retrieved 30 August 2020, from.
- Doolin, B. (1998). Information technology as disciplinary technology: being critical in interpretive research on information systems. *Journal of Information Technology*, 13, 301–311.
- Doolin, B. (2004). Power and Resistance in the Implementation of a Medical Management Information System. *Information Systems Journal* 14, 343-362. 2004.
- Doolin, B., & McLeod, L. (2005). Towards Critical Interpretivism in IS Research. In D. Howcraft & E. Trauth, *Handbook of Critical Information Systems Research: Theory and Application* (pp. 244-271). Edward Elgar Publishing Ltd.
- Drèze, J., & Sen, A. (2003). *Hunger and public action*. Oxford University Press.
- Du, W. D., Pan, S. L., Leidner, D. E. & Ying, W. (2019). Affordances, Experimentation and Actualization of FinTech: A Blockchain Implementation Study. *The Journal of Strategic Information Systems*, 28(1), 50–65.
- Earl Rinehart, K. (2020). Abductive Analysis in Qualitative Inquiry. *Qualitative Inquiry*, 27(2), 303-311.
- Early, J., Gonzalez, C., Gordon-Dseagu, V., & Robles-Calderon, L. (2019). Use of Mobile Health (mHealth) Technologies and Interventions Among Community Health Workers Globally: A Scoping Review. *Health Promotion Practice*, 20(6), 805-817.
- Evans, S., Pearce, K., Vitak, J., & Treem, J. (2016). Explicating Affordances: A Conceptual Framework for Understanding Affordances in Communication Research. *Journal of Computer-Mediated Communication*, 22(1), 35-52.
- Faraj, S., & Azad, B. (2012). The Materiality of Technology: An Affordance Perspective, in Leonardi, P. M., Nardi, B., and Kallinikos, J. (eds) *Materiality and Organizing: Social Interaction in a Technological World*. New York: Oxford University Press, 237–258.
- Fayad, A. L., & Weeks, J. (2014). Affordances for practice. *Information and Organization*, 24(4), 236–249.

- Fish, S. L. (1990). Interpretive Research: A New Way of Viewing Organizational Communication. *Public Administration Quarterly*, 14(1), 66-74.
- Flick, U. (2009). *An introduction to qualitative research*, London: Sage Publications.
- Florez-Arango, J., Iyengar, M., Dunn, K., & Zhang, J. (2011). Performance factors of mobile rich media job aids for community health workers. *Journal of The American Medical Informatics Association*, 18(2), 131-137.
- Foucault, M. (1980). *Power/Knowledge: Selected Interviews and Other Writings 1972–1977*. New York: Pantheon.
- Foucault, M. (1982a). The Subject and Power. *Critical Inquiry*, 8(4), 777-795.
- Foucault, M. (1982b). The subject and power. In: *Michel Foucault: Beyond Structuralism and Hermeneutics*, Dreyfus, H.L. & Rabinow, P. (eds), 208–226. New York: Harvester Wheatsheaf.
- Foucault, M. (1986). *The Care of the Self: The History of Sexuality Volume 3*. New York: Pantheon.
- Foucault, M. (1988). The ethic of care for the self as a practice of freedom: an interview with Michel Foucault, in Bernauer, J., & Rasmussen, David M., *The final Foucault*. Cambridge, Mass: MIT Press.
- Foucault, M. (1991). Governmentality, in G. Burchell, C. Gordon and P. Miller (eds), *The Foucault Effect: Studies in Governmentality*. Brighton: Harvester Wheatsheaf.
- Foucault, M. (1996). *Foucault Live: Collected Interviews 1961–1984*. New York, NY: Semiotexte.
- Foucault, M., & Hurley, Robert. (1990). *The care of the self*, in *The History of Sexuality Volume 3*. New York: Vintage Books.
- Foucault, M., & Hutton, Patrick H. (1988). *Technologies of the self: A seminar with Michel Foucault*. London: Tavistock.
- Foucault, M., Bertani, Mauro, Fontana, Alessandro, Ewald, François, & Macey, David. (2003). *Society must be defended: Lectures at the Collège de France, 1975-76*. New York: Picador.
- Fox, J., & McEwan, B. (2017). Distinguishing technologies for social interaction: The perceived social affordances of communication channels scale. *Communication Monographs*, 84(3), 298-318.
- Fromm, J., Mirbabaie, M., & Stieglitz, S. (2020). A Systematic Review of Empirical Affordance Studies: Recommendations for Affordance Research in Information Systems. Research-in-Progress Papers. In *Twenty-Eighth European Conference on Information Systems (ECIS2020)*. Marrakesh, Morocco.

- Gaver, W. W. (1991). Technology affordances. *In Proceedings of the SIGCHI Conference on Human factors in computing systems*, ACM: 79–84.
- Gaver, W.W. (1996). Situating Action II: Affordances for Interaction: The Social Is Material for Design. *Ecological Psychology*, 8, 111-129.
- Gera, R., Muthusamy, N., Bahulekar, A., Sharma, A., Singh, P., Sekhar, A., & Singh, V. (2015). An in-depth assessment of India's Mother and Child Tracking System (MCTS) in Rajasthan and Uttar Pradesh. *BMC Health Services Research*, 15(1).
- WHO / Key Country Indicators / India - key indicators. Apps.who.int. (2020). Retrieved 12 September 2020, from <https://apps.who.int/gho/data/node.cco.ki-IND?lang=en>.
- Gibson, J. J. (1979). *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin.
- Giddens, A. (1979). *Central problems in social theory*. London: Macmillan.
- Giddens, A. (1981). A Contemporary Critique of Historical Materialism. Vol. 1. *Power, Property, and the State*. London: Macmillan.
- Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Cambridge: Polity Press.
- Giddens, A. (1989). A Reply to My Critics in *Social Theory of Modern Societies: Anthony Giddens and His Critics*, D. Held and J. B. Thompson (eds.). Cambridge, UK: Cambridge University Press, 249-301.
- Giddens, A. (1990). *The Consequences of Modernity*. Cambridge, UK: Polity Press.
- Giddens, A., & Pierson, C. (1998). *Conversations with Anthony Giddens: Making Sense of Modernity*. Cambridge UK: Polity Press.
- Glenton, C., Scheel, I., Pradhan, S., Lewin, S., Hodgins, S., & Shrestha, V. (2010). The female community health volunteer programme in Nepal: Decision makers' perceptions of volunteerism, payment, and other incentives. *Social Science & Medicine*, 70(12), 1920-1927.
- Gopalakrishnan, L., Buback, L., Fernald, L., Walker, D., & Diamond-Smith, N. (2020). Using mHealth to improve health care delivery in India: A qualitative examination of the perspectives of community health workers and beneficiaries. *PLOS ONE*, 15(1), e0227451.
- Gopalan, S., Mohanty, S., & Das, A. (2012). Assessing community health workers' performance motivation: a mixed-methods approach on India's Accredited Social Health Activists (ASHA) programme. *BMJ Open*, 2(5), e001557.
- Gordon, C. (1980). *Foucault: Power/Knowledge: Selected Interviews and Other Writings 1972–77*. Brighton: Harvester Wheatsheaf.

- Government of India (2011). Census of India. Retrieved 5 August 2020, from https://censusindia.gov.in/2011census/dchb/2405_PART_B_DCHB_SABAR%20KANTHA.pdf
- Grgecic, D., Holten, R., & Rosenkranz, C. (2015). The Impact of Functional Affordances and Symbolic Expressions on the Formation of Beliefs. *Journal of the Association for Information Systems*, 16(7), 580–607.
- Grünbaum, N. (2007). Identification of ambiguity in the case study research typology: what is a unit of analysis? *Qualitative Market Research: An International Journal*, 10(1), 78-97.
- Guba, E.G. & Lincoln, Y.S. (1994). Competing Paradigms in Qualitative Research. *Handbook of qualitative research*, 105–117.
- Guillemin, M., & Gillam, L. (2004). Ethics, Reflexivity, and Ethically Important Moments in Research. *Qualitative Inquiry*, 10(2), 261–280.
- Gupta, K., & Yesudian, P. (2006). Evidence of women’s empowerment in India: a study of socio-spatial disparities. *Geojournal*, 65(4), 365-380.
- Hall, C., Fottrell, E., Wilkinson, S., & Byass, P. (2014). Assessing the impact of mHealth interventions in low- and middle-income countries – what has been shown to work? *Global Health Action*, 7.
- Hampshire, K., Porter, G., Mariwah, S., Munthali, A., Robson, E., & Owusu, S. et al. (2016). Who bears the cost of ‘informal mhealth’? Health-workers’ mobile phone practices and associated political-moral economies of care in Ghana and Malawi. *Health Policy and Planning*, 32(1), 34-42.
- Harding, S. (1995). Can feminist thought make economics more objective? *Feminist Economics*, 1(1),
- Harré, R. (1983). Commentary from an ethogenic standpoint. *Journal for the Theory of Social Behaviour*, 13, 69–73.
- Hartstock, N. (1998). Chapter 1. In *Feminist standpoint revisited and other essays*. Routledge.
- Hassan, N. (2011). Is information systems a discipline? Foucauldian and Toulminian insights. *European Journal of Information Systems: Including a Special Section on Kleinian Approach to Information Systems Research*, 20(4), 456-476.
- Heft, H. (2003). Affordances, Dynamic Experience, and the Challenge of Reification. *Ecological Psychology*, 15(2), 149–180
- Hill, M. (2003). DEVELOPMENT AS EMPOWERMENT. *Feminist Economics*, 9(2-3), 117-135.
- Honneth, A. (1993). *The Critique of Power: Reflective Stages in a Critical Social Theory*. Cambridge, MA: MIT Press.

- Howcroft, D., & Light, B. (2006). Reflections on issues of power in packaged software selection. *Information Systems Journal*, 16(3), 215-235.
- Hoy, D., & McCarthy, T. (1994). *Critical Theory*. Oxford: Blackwell.
- Hsieh, Y. (2012). Online social networking skills: The social affordances approach to digital inequality. *First Monday*, 17(4).
- Hussain, F., & Amin, S. (2018). I don't care about their reactions: agency and ICTs in women's empowerment in Afghanistan. *Gender & Development*, 26(2), 249-265.
- Hussain, Z., & Cornelius, N. (2009). The use of domination and legitimation in information systems implementation. *Information Systems Journal*, 19(2), 197-224.
- Hutchby, I. (2001). Technologies, Texts and Affordances. *Sociology*, 35(2), 441-456.
- Ibrahim, S., & Alkire, S. (2007). Agency and Empowerment: A Proposal for Internationally Comparable Indicators. *Oxford Development Studies*, 35(4), 379-403.
- Ilozumba, O., Dieleman, M., Kraamwinkel, N., Van Belle, S., Chaudoury, M., & Broerse, J. (2018). "I am not telling. The mobile is telling": Factors influencing the outcomes of a community health worker mHealth intervention in India. *PLOS ONE*, 13(3), e0194927.
- India / History, Map, Population, Economy, & Facts. Encyclopedia Britannica. (2020). Retrieved 12 September 2020, from <https://www.britannica.com/place/India>.
- Ingram, C., Teigland, R., & Vaast, E. (2014). Solving the puzzle of crowdfunding: Where technology affordances and institutional entrepreneurship collide. In *Proceedings of 47th Hawaii International Conference on Systems Science*, IEEE: 4556-4567.
- Introna, L. (2003). Disciplining information systems: Truth and its regimes. *European Journal of Information Systems*, 12, 235-40.
- Introna, L. D. (2001). Truth and its politics: Evolving regimes of truth at the MISQ, in D. Howcroft and A. Adam (eds), *(Re)Defining Critical Research in Information Systems, Proceedings of the CRIS Workshop*, 45-55. Salford: University of Salford.
- Jasperson, J., Carte, T.A., Saunders, C.S., Butler, B.S., Croes, H.J.P., & Zheng, W. (2002). Review: power and information technology research: a metatriangulation review. *MIS Quarterly* 26, 397-495.
- Jones, M. R. (1999). Structuration theory, in *Re-thinking Management Information Systems*, W. J. Currie and R. Galliers (eds.). Oxford: Oxford University Press, 103-135.
- Jones, M. R., & Karsten, H. (2008). Giddens's structuration theory and information systems Research. *MIS Quarterly*, 32(1), 127-157.

- Jones, M., Orlikowski, W., & Munir, K. (2004). Structuration Theory and Information Systems: A Critical Reappraisal in *Social Theory and Philosophy for Information Systems*, Willcocks, L., Mingers, J (eds). John Wiley and Sons Ltd, 297-329.
- Jung, Y., & Lyytinen, K. (2014). Towards an Ecological Account of Media Choice: A Case Study on Pluralistic Reasoning while Choosing Email. *Information Systems Journal*, 24(3), pp. 271–293.
- Kabeer, N. (1999). Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. *Development and Change*, 30(3), 435-464.
- Kabeer, N. (2001). Reflections on the measurement of women's empowerment – theory and practice, *Discussing Women's Empowerment—Theory and Practice*. Stockholm: Novum Grafiska.
- Kabeer, N. (2005). Gender equality and women's empowerment: A critical analysis of the third millennium development goal 1. *Gender & Development*, 13(1), 13-24.
- Kane, G. C., Bijan, A., Majchrzak, A., & Faraj, S. (2011). The Paradoxical Influence of Social Media Affordances on Intellectual Capital Creation. *Paper presented at the Academy of Management Annual Meeting*, San Antonio.
- Kaphle, S., Chaturvedi, S., Chaudhuri, I., Krishnan, R., & Lesh, N. (2015). Adoption and Usage of mHealth Technology on Quality and Experience of Care Provided by Frontline Workers: Observations from Rural India. *JMIR Mhealth And Uhealth*, 3(2), e61.
- Kapondera, S., Bernardi, R., & Panteli, N. (2019). A framework for understanding the empowerment effects of telecentres on rural communities in developing countries. In *15th IFIP WG 9.4 International Conference on Social Implications of Computers in Developing Countries, ICT4D*. Dar es Salaam, Tanzania.
- Karahanna, E., Xu, S. X., Xu, Y. & Zhang, A. (2018). The Needs–Affordances–Features Perspective for the Use of Social Media. *Management Review*, 2(26), 289–310.
- Karlsen, C., Haraldstad, K., Moe, C. E. & Thygesen, E. (2019). Challenges of Mainstreaming Telecare: Exploring Actualization of Telecare Affordances in Home Care Services. *Scandinavian Journal of Information Systems*, 31(1), pp. 31–66.
- Karsten, H. (2003). Constructing Interdependencies with Collaborative Information Technology. *Computer Supported Cooperative Work*, 12(4), 437-464.
- Karuna Trust. (2020). *Karuna Trust Annual Report*. Retrieved from https://www.karunatrust.org/wp-content/uploads/2020/01/Karuna-Trust-Annual-Report_2018-2019.pdf
- Kelly, M. G. E. (2013). Foucault, Subjectivity, and Technologies of the Self. *A Companion to Foucault*, 510-525. John Wiley & Sons.

- Kemal, A. (2018). Mobile banking in the government-to-person payment sector for financial inclusion in Pakistan. *Information Technology for Development*, 25(3), 475-502.
- Kenny, K. (2014). Power and the Construction of Independence in ICTD Organizations. *Information Technology for Development* 20(1), 6-22.
- Kimaro, H.C., & Nhampossa, J. (2005). Analysing the Problem of Unsustainable Health Information Systems in Less-Developed Economies: Case studies from Tanzania and Mozambique. *Information Technology for Development*, 11(3), 273-299.
- Knights, D. (1995). Refocusing the case study: the politics of research and researching politics in IT management. *Technology Studies*, 2, 230–254.
- Knights, D., & Murray, F. (1994). *Managers Divided: Organisation Politics and Information Technology Management*. Wiley, Chichester.
- Knights, D., & Willmott, H. (1989). Power and subjectivity at work: from degradation to subjugation in social relations. *Sociology*, 23(4), 535-58.
- Kraner, O., Luther, P. & Jost, M. (2018). Key Affordances of Platform-as-a-Service: Self-Organization and Continuous Feedback. *Journal of Management Information Systems*, 35(3), 776–812.
- Kritzman, L. (1988). *Foucault, M: Politics, Philosophy, Culture: Interviews and Other Writings 1977–1984*. New York: Routledge, Chapman and Hall.
- Kvale, S. (1996). *Interviews: An Introduction to Qualitative Research Interviewing*, Thousand Oaks, CA: Sage
- Kvale, S. (2006). Dominance Through Interviews and Dialogues. *Qualitative Inquiry*, 12(3), 480–500.
- Kwapong, O. (2009). An Empirical Study of Information and Communication Technology for Empowerment of Rural Women in Ghana. *African Journal of Information & Communication Technology*, 4(3).
- Lanamäki, A., Thapa, D., & Stendal, K. (2016). When is an affordance? Outlining four stances. In Beyond interpretivism? New encounters with technology and organization. *IFIP WG 8.2 Working Conference on Information Systems and Organizations*. Dublin, Ireland, December 9-10, 2016, Proceedings. Springer International Publishing: 125–139.
- Lather, P. (1992). Critical Frames in Educational Research: Feminist and Post-Structural Perspectives. *Theory into Practice*, 31, 87–99.

- Layder, D. (1987). Key Issues in Structuration Theory: Some Critical Remarks. *Current Perspectives in Social Theory* 8, 25-46.
- Ledford, C. J. W., Canzona, M. R., Cafferty, L. A., & Hodge, J. A. (2016). Mobile application as a prenatal education and engagement tool: A randomized controlled pilot. *Patient Education and Counselling*, 99, 578-582.
- Lee, A. S. (1991). Integrating Positivist and Interpretive Approaches to Organizational Research. *Organization Science*, 2(4), 342-365.
- Lee, A. S., & Baskerville, R. L. (2003). Generalizing Generalizability in Information Systems Research. *Information Systems Research*, 14(3), 221-243.
- Lee, S., Nigmatov, U., Nwaru, B., Mukherjee, M., Grant, L., & Pagliari, C. (2015). Effectiveness of mHealth interventions for maternal, newborn and child health in low- and middle-income countries: Systematic review and meta-analysis. *Journal of Global Health*, 6(1).
- Lehmann, U., & Sanders, D. (2007), Community health workers: What do we know about them? The state of the evidence on programs, activities, costs, and impact on health outcomes of using community health workers. *Evidence and Information for Policy*. Department of Human Resources for Health Geneva.
- Lehrer, C., Wieneke, A., Vom Brocke, J., Jung, R. & Seidel, S. (2018). How Big Data Analytics Enables Service Innovation: Materiality, Affordance, and the Individualization of Service. *Journal of Management Information Systems*, 35(2), 424-460.
- Leidner, D. E., Gonzalez, E. & Koch, H. (2018). An Affordance Perspective of Enterprise Social Media and Organizational Socialization. *The Journal of Strategic Information Systems*, 27(2), 117-138.
- Leonardi, P. M. (2011). When flexible routines meet flexible technologies: Affordance, constraint, and the imbrication of human and material agencies. *MIS Quarterly*, 35(1), 147-168.
- Leonardi, P. M. (2013). When does technology use enable network change in organizations? A comparative study of feature use and shared affordances. *MIS Quarterly*, 37(3), 749-775.
- Leonardi, P. M., & Barley, S. R. (2010). What's under construction here? Social action, materiality, and power in constructivist studies of technology and organizing. *Academy of Management Annals*, 4(1), 1-51.
- Leonardi, P., Bailey, D., & Pierce, C. (2019). The Coevolution of Objects and Boundaries over Time: Materiality, Affordances, and Boundary Salience. *Information Systems Research*, 30(2), 665-686.

- Lho, N., Chigona, W., & Malanga, D. (2018). How Information and Communication Technologies Empower Disadvantaged Communities in Cape Town, South Africa. *In Proceedings of SAICSIT*. Port Elizabeth, South Africa.
- Lindberg, A., Gaskin, J., Berente, N., & Lyytinen, K. (2014). Exploring Configurations of Affordances: The Case of Software Development. *Proceedings of the Twentieth Americas Conference on Information Systems*, Savannah, 2014, 1-12.
- Lukes, S. (1974). *Power: A Radical View*. New York: MacMillan.
- Lund, S., Hemed, M., Nielsen, B., Said, A., Said, K., Makungu, M., & Rasch, V. (2012). Mobile phones as a health communication tool to improve skilled attendance at delivery in Zanzibar: a cluster-randomised controlled trial. *BJOG: An International Journal of Obstetrics & Gynaecology*, 119(10), 1256-1264.
- Lund, S., Nielsen, B., Hemed, M., Boas, I., Said, A., & Said, K. et al. (2014). Mobile phones improve antenatal care attendance in Zanzibar: a cluster randomized controlled trial. *BMC Pregnancy and Childbirth*, 14(1).
- Lyon, D. (1994) *The Electronic Eye: The Rise of Surveillance Society*. Cambridge: Polity Press.
- Lyon, D. (2003). *Surveillance as Social Sorting*. London: Routledge.
- Lyytinen, K., & King, J. L. (2004). Nothing at the Centre? Academic Legitimacy in the Information Systems Field. *Journal of the Association for Information Systems* 5(6), 220-247.
- Maes, K. (2014). "Volunteers Are Not Paid Because They Are Priceless": Community Health Worker Capacities and Values in an AIDS Treatment Intervention in Urban Ethiopia. *Medical Anthropology Quarterly*, 29(1), 97-115.
- Maier, J.R., & Fadel, G.M. (2008). Affordance based design: a relational theory for design. *Research in Engineering Design*, 20(1), 13-27.
- Maier, S., & Nair-Reichert, U. (2008). Empowering Women Through ICT-Based Business Initiatives: An Overview of Best Practices in E-Commerce/E-Retailing Projects. *Information Technologies and International Development*, 4(2), 43-60.
- Majchrzak, A., Markus, M. L., & Wareham, J. (2016). Designing for digital transformation: Lessons for information systems research from the study of ICT and societal challenges. *MIS Quarterly*, 40(2), 267-277.
- Malhotra, A., & Schuler, S. (2005). Women's Empowerment as a Variable in International Development. In D. Narayan, *Measuring Empowerment: Cross Disciplinary Perspectives* (pp. 71-89).

- Mangwi Ayiasi, R., Kolsteren, P., Batwala, V., Criel, B., & Orach, C. (2016). Effect of Village Health Team Home Visits and Mobile Phone Consultations on Maternal and Newborn Care Practices in Masindi and Kiryandongo, Uganda: A Community-Intervention Trial. *PLOS ONE*, 11(4), e0153051.
- Marabelli, M., & Galliers, R. D. (2017). A Reflection on Information Systems Strategizing: The Role of Power and Everyday Practices. *Information Systems Journal* 27(3), 347-366.
- Markula, P. (2003). The technologies of the self: Sport, feminism, and Foucault. *Sociology of Sport Journal*, 20(2), 87-107.
- Markus, M. L., & Silver, M. S. (2008). A Foundation for the Study of IT Effects: A New Look at DeSanctis and Poole's Concepts of Structural Features and Spirit. *Journal of the Association for Information systems*, 9(10), 609–632.
- Martin, L.H., Patrick, H., & Gutman, H. (1988). Technologies of the Self: A Seminar with Michel Foucault. Tavistock, London, 16-49.
- Mason, K. (2005). Measuring Women's Empowerment: Learning from Cross National Research. In D. Narayan, *Measuring Empowerment: Cross Disciplinary Perspectives* (pp. 89-103). World Bank.
- Mavalankar, D., Vora, K., Ramani, K., Raman, P., Sharma, B., & Upadhyaya, M. (2009). Maternal Health in Gujarat, India: A Case Study. *Journal of Health, Population and Nutrition*, 27(2).
- McKenna, B. (2019). Creating Convivial Affordances: A Study of Virtual World Social Movements. *Information Systems Journal*, 1–30.
- Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco, CA: Jossey-Bass.
- Mettler, T. and Wulf, J. (2018). Physiolytics at the Workplace: Affordances and Constraints of Wearables Use from an Employee's Perspective. *Information Systems Journal*, 29(1), 245–273.
- Michaels, C., & Carello, C. (1981). *Direct perception*. Englewood Cliffs, N.J.: Prentice-Hall.
- Miller, P. (1987). *Domination and Power*. London: Routledge and Kegan Paul, London.
- Ministry of Health and Family Welfare. (2013). *NATIONAL RURAL HEALTH MISSION: Implementation Framework*. Ministry of Health and Family Welfare. Retrieved from <https://nhm.gov.in/WriteReadData/l892s/nrhm-framework-latest.pdf>
- Ministry of Health and Family Welfare. (2020). National Rural Health Mission: National Health Mission. Retrieved 4 August 2020, from <https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=969&lid=49>

Ministry of Panchayati Raj (2009). *EVALUATION STUDY OF BACKWARD REGIONS GRANT FUND (BRGF)*. Government of India. Retrieved from https://web.archive.org/web/20120405033402/http://www.nird.org.in/brgf/doc/brgf_BackgroundNote.pdf

Mishler, E.G. (1986). *Research Interviewing: Context and Narrative*. Cambridge, Harvard

Modi, D., Desai, S., Dave, K., Shah, S., Desai, G., & Dholakia, N. et al. (2017). Cluster randomized trial of a mHealth intervention “ImTeCHO” to improve delivery of proven maternal, neonatal, and child care interventions through community-based Accredited Social Health Activists (ASHAs) by enhancing their motivation and strengthening supervision in tribal areas of Gujarat, India: study protocol for a randomized controlled trial. *Trials*, 18(1).

Monteiro, E. & Hanseth, O. (1996). Social Shaping of Information Infrastructure, in: *Information Technology and Changes in Organizational Work*, Orlikowski, W.J., Walsham, G., Jones, M. and J.I. Degross (Eds.). Chapman and Hall, London.

Mukherjee, A.S. (2015). Understanding empowerment through technology driven power structures: Case from mother and child tracking system in India. *International Federation of Information Processing (IFIP) 9.4*, Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo - Sri Lanka

Mumford, E. (2006). The story of socio-technical design: reflections on its successes, failures, and potential. *Information Systems Journal*, 16, 317–342.

Myers, M., & Klein, H. (2011). A set of principles for conducting critical research in information systems. *MIS Quarterly*, 35(1), 17-36.

Myers, M.D. (2009). *Qualitative Research in Business and Management*, London: Sage.

Myers, M.D. (2013). *Qualitative Research in Business & Management*, London: Sage.

Myers, MD., & Klein, HK. (2001) A classification scheme for interpretive research in information systems, in *Qualitative research in IS: issues and trends*. Hershey, PA: IGI Global, 218-239.

Nagarajan, M. (2014). *Swasthya Samvedna Sena*. Presentation. Retrieved from <https://www.slideshare.net/mnagarajani/swasthya-samvedana-sena-modern-public-health-communication-tool>.

Nagasundram, M., & Bostrom, R.P. (1994). The structuring of creative processes using GSS: a framework for research. *Journal of Management Information Systems* 11(3) 87-114.

- Naik, P., Shilpa, D., Shewade, H., & Sudarshan, H. (2020). Assessing the implementation of a mobile App-based electronic health record: A mixed-method study from South India. *Journal of Education and Health Promotion*, 9(1), 102.
- Nandhakumar, J., & Jones, M. R. (1997). Designing in the Dark: The Changing User–Developer Relationship in Information Systems Development. In *Proceedings of the 18th International Conference on Information Systems*, K. Kumar and J. I. DeGross (eds.). Atlanta, GA, December 15-17, 75-86.
- Nandhakumar, J., & Jones, M. R. (2001). Accounting for Time: Managing Time in Project-Based Teamworking. *Accounting, Organizations and Society* 26, 193-214.
- Nandi, S., & Schneider, H. (2014). Addressing the social determinants of health: a case study from the Mitandin (community health worker) program in India. *Health Policy and Planning*, 29(2), 71-81.
- Narayan, D. (2005). Conceptual Framework and Methodological Challenges. In D. Narayan, *Measuring Empowerment: Cross Disciplinary Perspectives* (pp. 3-39). World Bank.
- Narayan, D. (2005). *Measuring empowerment; Cross Disciplinary Perspectives*. World Bank.
- Nayak, R. (2010). *Role of Karuna Trust – A Public-Private-Partnership Venture in Delivering of Health Services (Master's Dissertation)*. Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore.
- Neuman, W.L. (1997). *Social research method: Qualitative and Quantitative approaches*. Allyn and Bacon.
- New, C. (1994). Structure, Agency, and Social Transformation. *Journal for the Theory of Social Behaviour* 24(3), 187-205.
- Ngabo, F., Nguimfack, J., Nwaigwe, F., Mugeni, C., Muhoza, D., Wilson, D. R., Kalach, J., Gakuba, R., Karema, C., & Binagwaho, A. (2012). Designing and Implementing an Innovative SMS-based alert system (RapidSMS-MCH) to monitor pregnancy and reduce maternal and child deaths in Rwanda. *The Pan African medical journal*, 13, 31.
- Nguyen, H., Chib, A., & Mahalingam, R. (2017). Mobile Phones and Gender Empowerment: Negotiating the Essentialist – Aspirational Dialectic. *Information Technologies & International Development* (Special Section). 13, 171–185
- Nimmagadda, S., Gopalakrishnan, L., Avula, R., Dhar, D., Diamond-Smith, N., & Fernald, L. et al. (2019). Effects of an mHealth intervention for community health workers on maternal and child nutrition and health service delivery in India: protocol for a quasi-experimental mixed-methods evaluation. *BMJ Open*, 9(3), e025774.

- Noordam, A., Kuepper, B., Stekelenburg, J., & Milen, A. (2011). Improvement of maternal health services through the use of mobile phones. *Tropical Medicine & International Health*, 16(5), 622-626.
- Norman, D. A. (1999). *Affordance, conventions, and design*. *Interactions*, 6(3), 38–43.
- Norman, D.A. (1988). *The Psychology of Everyday Things*. Basic Books, New York, NY.
- Nugroho, D., & Lonsdale, M. (2010). Evaluation of OLPC programs global: a literature review. Retrieved from https://research.acer.edu.au/digital_learning/8.
- Nyella, E. & Mndeme, M. (2010). Power Tensions in Health Information System Integration in Developing Countries: The Need for Distributed Control. *The Electronic Journal of Information Systems in Developing Countries*, 43(1), 1-19.
- Nyemba-Mudenda, M., & Chigona, W. (2017). mHealth outcomes for pregnant mothers in Malawi: a capability perspective. *Information Technology for Development*, 24(2), 245-278. doi: 10.1080/02681102.2017.1397594
- Orlikowski, W. J. & Scott, S. V. (2008). Sociomateriality: Challenging the Separation of Technology, Work and Organization. *The Academy of Management Annals*, 2(1), 433–474.
- Orlikowski, W. J. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, 3(3), 398-427.
- Orlikowski, W. J. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organisation Science*, 11(4), 404-428.
- Orlikowski, W. J., & Barley, S. R. (2001). Technology and Institutions: What Can Research on Information Technology and Research on Organizations Learn from Each Other? *MIS Quarterly* 25(2), 145-165.
- Orlikowski, W. J., & Robey, D. (1991). Information Technology and the Structuring of Organizations. *Information Systems Research* 2(2), 143-169.
- Orlikowski, W. J., & Robey, D. (1991). Information Technology and the Structuring of Organizations. *Information Systems Research* 2(2), 143-169.
- Orlikowski, W.J. & Baroudi, J.K. (1991). Studying Information Technology in Organizations: Research Approaches and Assumptions. *Information Systems Research*, 2(1), pp.1–28.
- Orlikowski, WJ. (2007). Sociomaterial practices: exploring technology at work. *Organization Studies*, 28(9), 1435-1448.

- Osman, M., & Tanner, M. (2017). The Influence of Telecentre Components on the Psychological Empowerment of Underserved Community Members in the Western Cape, South Africa. *The Electronic Journal of Information Systems in Developing Countries*, 81(1), 1-29.
- Ottenberg, S. (1990). Thirty years of fieldnotes: Changing relationships to the text. In R. Sanjek (Ed.), *Fieldnotes: The makings of anthropology* (pp. 139–160). Ithaca, NY: Cornell University Press.
- Our Projects – MoDe India. (2020). Retrieved 5 August 2020, from <https://modeindia.co.in/projects/>
- Oxaal, Z., & Baden, S. (1997). *Gender and empowerment*. BRIDGE, Institute of Development Studies.
- Oxfam. (1995). *The Oxfam handbook of development and relief*. Oxfam.
- Pandey, P., Chandwani, R., & Sarin, A. (2020) Empowerment and mHealth. Working paper.
- Patel, A., Kuhite, P., Alam, A., Pusdekar, Y., Puranik, A., & Khan, S. et al. (2019). M-SAKHI—Mobile health solutions to help community providers promote maternal and infant nutrition and health using a community-based cluster randomized controlled trial in rural India: A study protocol. *Maternal & Child Nutrition*, 15(4).
- Patton, M.Q. (2002), *Qualitative Evaluation and Research Methods*, 3rd ed. Newbury Park, CA: Sage Publications.
- Perkins, D., & Zimmerman, M. (1995). Empowerment theory, research, and application. *American Journal of Community Psychology*, 23(5), 569-579.
- Phillippi, J., & Lauderdale, J. (2018). A Guide to Field Notes for Qualitative Research: Context and Conversation. *Qualitative Health Research*, 28(3), 381–388.
- Poole, M. (2009). Response to Jones and Karsten, Giddens's Structuration Theory and Information Systems Research. *MIS Quarterly*, 33(3).
- Porter, G., Hampshire, K., Abane, A., Munthali, A., Robson, E., & De Lannoy, A. et al. (2020). Mobile phones, gender, and female empowerment in sub-Saharan Africa: studies with African youth. *Information Technology for Development*, 26(1), 180-193.
- Poster, M. (1996). Databases as discourse, or, Electronic interpellations, in D. Lyon and E. Zureik (eds), *Computers, Surveillance and Privacy*. Minneapolis, MN: University of Minnesota Press.
- Poster, M. (2001). *What's the Matter with the Internet*, Minneapolis. MN: University of Minnesota Press.
- Pozzebon, M. (2004). The Influence of a Structurationist View on Strategic Management Research. *Journal of Management Studies* 41(2), 247-272.

- Pozzebon, M., & Pinsonneault, A. (2005). Challenges in conducting empirical work using structuration theory: Learning from IT research. *Organization Studies*, 26(9), 1353-1376.
- Pozzi, G., Pigni, F. & Vitari, C. (2014). Affordance Theory in the IS Discipline: A Review and Synthesis of the Literature in *Proceedings of the Americas Conference on Information Systems*. Savannah, GA, USA.
- Prakasam, N., & Huxtable-Thomas, L. (2020). Reddit: Affordances as an Enabler for Shifting Loyalties. *Information Systems Frontiers*.
- Prasad, A. (2009). Understanding Successful Use of Technology in Organisations in Developing Countries: A Structural Perspective. *The Electronic Journal of Information Systems in Developing Countries*, 37(1), 1-9.
- Prasad, B. & Muralidharan, V. (2007). Community Health Workers: a review of concepts, practice, and policy concerns. Working paper 1 by *International Consortium for Research on Equitable Health Systems (CREHS)*. Retrieved from http://www.crehs.lshtm.ac.uk/Community_health_workers_prasad.pdf.
- Prasanth, N. (2011). Public-Private Partnerships and Health Policies. *Economic and Political Weekly*, 46(42), 13-15.
- Primary Healthcare | Karuna Trust. (2020). Retrieved 5 August 2020, from http://www.karunatrust.com/?page_id=124
- Prince, R., & Brown, H. (2016). Introduction: the politics & ethics of voluntary labour in Africa, in: Prince R, Brown H. (eds). *Volunteer Economies: The Politics and Ethics of Voluntary Labour in Africa*. Boydell and Brewer: Rochester, USA, 1–28.
- Prinja, S., Bahuguna, P., Gupta, A., Nimesh, R., Gupta, M., & Thakur, J. (2018). Cost effectiveness of mHealth intervention by community health workers for reducing maternal and newborn mortality in rural Uttar Pradesh, India. *Cost Effectiveness and Resource Allocation*, 16(1).
- Prinja, S., Nimesh, R., Gupta, A., Bahuguna, P., Thakur, J., Gupta, M., & Singh, T. (2016). Impact assessment and cost-effectiveness of m-health application used by community health workers for maternal, newborn and child health care services in rural Uttar Pradesh, India: a study protocol. *Global Health Action*, 9(1), 31473.
- Pscheidt, M. (2011). Structural analysis of cross-cultural development of an academic registry information system in Mozambique. *Information Technology for Development*, 17(3), 168-186.
- Rappaport, J. (1987). Terms of empowerment/exemplars of prevention: Toward a theory for community psychology. *American Journal of Community Psychology*, 15(2), 121-148.

- Razvi, S., Srivastava, R., & Halder, B. (2016). *Mobile Phone: A Public Tool. Analysing the use of mobile technology in civic participation, education, and health*. Digital Empowerment Foundation and UNICEF India. Retrieved from <https://www.apc.org/en/pubs/mobile-phone-public-tool-analysing-use-mobile-tech>
- Reider, A., Lehrer, C., & Reinhard, J. (2020). Affordances and Behavioural Outcomes of Wearable Activity Trackers. In *Twenty-Eighth European Conference on Information Systems (ECIS2020)*. Marrakesh, Morocco.
- Ritchie, J. & Lewis, J. (2003). *Qualitative Research Practice: A Guide for Social Science Students and Researchers*, London: Sage Publications Ltd.
- Robey, D., & Anderson, C. (2013). Information technology, materiality, and organizational change: A professional odyssey. *Journal of the Association for Information Systems*, 14(7), 379–398.
- Rose, J. (1998). Evaluating the Contribution of Structuration Theory to the Information Systems Development. *Proceedings of the 6th European Conference on Information Systems*, Aix-en-Provence, France, June 4-6.
- Rose, J., & Lewis, P. (2001). Using Structuration Theory in Action Research: An Intranet Development Project in *Realigning Research in Practice in Information Systems Development: The Social and Organizational Perspective*, N. L. Russo, B. Fitzgerald, and J. I. DeGross (eds.). Boston: Kluwer Academic Publishers, 273-295.
- Rose, J., Jones, M., & Truex, D. (2005). Socio-Theoretic Accounts of IS: The Problem of Agency. *Scandinavian Journal of Information Systems* 17(1), 135-152.
- Rowlands, J. (1995). Empowerment examined. *Development in Practice*, 5(2), 101-107.
- Rowlands, J. (1997). *Questioning empowerment*. Oxfam.
- Ruton, H., Musabyimana, A., Gaju, E., Berhe, A., Grépin, K., & Ngenzi, J. et al. (2018). The impact of an mHealth monitoring system on health care utilization by mothers and children: an evaluation using routine health information in Rwanda. *Health Policy and Planning*, 33(8), 920-927.
- Sadan, E. (1997). *Empowerment and community planning: Theory and practice of people-focused social solutions*. Hakibbutz Hameuchad.
- Sadler, E. & Given, L.M. (2007). Affordance theory: a framework for graduate studies' information behavior. *Journal of Documentation*, 63(1) 115-141.
- Sahay, S. (2016). Are We Building A Better World with ICTs? Empirically Examining This Question in The Domain of Public Health in India. *Information Technology for Development*, 22(1).

- Salazar, M., Vora, K., & De Costa, A. (2016). Bypassing health facilities for childbirth: a multilevel study in three districts of Gujarat, India. *Global Health Action*, 9(1), 32178.
- Samman, E., & Santos, M. (2009). *Agency and Empowerment: A review of concepts, indicators, and empirical evidence* (pp. 1- 48). Oxford Poverty and Human Development Initiative, Oxford University Press.
- Sarker, S., & Sahay, S. (2003). Understanding Virtual Team Development: An Interpretive Study. *Journal of the Association for Information Systems*, 4(1).
- Scapens, R. W., & Macintosh, N. B. (1996). Structure and Agency in Management Accounting Research: A Response to Boland's Interpretive Act. *Accounting, Organizations and Society*, 21(7,8), 675.
- Schoen, J., Mallett, J., Grossman-Kahn, R., Brentani, A., Kaselitz, E., & Heisler, M. (2017). Perspectives and experiences of community health workers in Brazilian primary care centers using m-health tools in home visits with community members. *Human Resources for Health*, 15(1).
- Schönher, M. (2017). Deleuze, a Split with Foucault. *Le Foucauldien*, 1(1), 8.
- Schultze, U., & Orlikowski, W. J. (2004). A practice perspective on technology-mediated network relations: The use of Internet-based self-serve technologies. *Information System Research*, 15(1), 87-106.
- Scott, K., George, A., & Ved, R. (2019). Taking stock of 10 years of published research on the ASHA programme: examining India's national community health worker programme from a health systems perspective. *Health Research Policy and Systems*, 17(1).
- Scott, K., Javadi, D., & Gergen, J. (2020). India's Auxiliary Nurse-Midwife, Anganwadi Worker, Accredited Social Health Activist, Multipurpose Worker, and Lady Health Visitor Programs. Retrieved 11 August 2020, from <https://chwcentral.org/indias-auxiliary-nurse-midwife-anganwadi-worker-accredited-social-health-activist-multipurpose-worker-and-lady-health-visitor-programs/>
- Seidel, S., Recker, J., & Vom Brocke, J. (2013). Sensemaking and sustainable practicing: Functional affordances of information systems in green transformations. *MIS Quarterly*, 37(4), 1275–1299.
- Sein, M., Thapa, D., Hatakka, M., & Sæbø, Ø. (2019). A holistic perspective on the theoretical foundations for ICT4D research. *Information Technology for Development*, 25(1), 7-25.
- Sen, A. (1985). *Commodities and capabilities*, Professor Dr P. Hennipman, *Lectures in Economics* (p. 130). North-Holland; Elsevier Science.

- Seshadri, T., Madegowda, C., Babu, G., & Nuggehalli Srinivas, P. (2019). Implementation Research with the Soliga Indigenous Community in Southern India for Local Action on Improving Maternal Health Services.
- Sewell, W. H. (1992). A theory of structure: Duality, agency, and transformation. *The American Journal of Sociology*, 98(1), 1-29.
- Shaw, R., Kinsella-Shaw, J., & Mace, W. (2019). Affordance Types and Affordance Tokens: Are Gibson's Affordances Trustworthy? *Ecological Psychology*, 31(1), 49-75.
- Silva, L. (2007). Epistemological and theoretical challenges for studying power and politics in information systems. *Information Systems Journal* 17(2), 165–183.
- Smith, M., & Seward, S. (2009). The Relational Ontology of Amartya Sen's Capability Approach: Incorporating Social and Individual Causes. *Journal of Human Development and Capabilities*, 10(2), 213-235.
- SOCHARA. (2005). An external evaluative study of the State Health Resource Centre (SHRC) and the Mitnin Programme. Final report. Bangalore, Society for Community Health Awareness, Research and Action (SOCHARA). Retrieved from http://www.sochara.org/sites/default/files/mitanin_Review.pdf.
- Social Research Association. (2002). Ethical Guidelines. Retrieved from <http://the-sra.org.uk/wpcontent/uploads/SRA-Ethics-guidelines-2002.pdf>.
- Som, M. (2016). Volunteerism to Incentivisation: Changing Priorities of Mitnins Work in Chhattisgarh. *Indian Journal of Gender Studies*, 23(1), 26-42.
- Sondaal, S., Browne, J., Amoakoh-Coleman, M., Borgstein, A., Miltenburg, A., Verwijs, M., & Klipstein-Grobusch, K. (2016). Assessing the Effect of mHealth Interventions in Improving Maternal and Neonatal Care in Low- and Middle-Income Countries: A Systematic Review. *PLOS ONE*, 11(5), e0154664.
- Sriram, S. (2018). Availability of infrastructure and manpower for primary health centres in a district in Andhra Pradesh, India. *Journal of Family Medicine and Primary Care*, 7(6), 1256.
- Srivastava, A., Gope, R., Nair, N., Rath, S., Rath, S., & Sinha, R. et al. (2015). Are village health sanitation and nutrition committees fulfilling their roles for decentralised health planning and action? A mixed methods study from rural eastern India. *BMC Public Health*, 16(1).
- Stahl, B. (2008). The ethical nature of critical research in information systems. *Information Systems Journal*, 18(2), 137-163.

- Stendal, K., Thapa, D., & Lanamäki, A. (2016). Analyzing the concept of affordances in information systems. In *Proceedings of 49th Hawaii International Conference on System Sciences (HICSS)*, IEEE: 5270–5277.
- Stoffregen, T. A. (2003). Affordances as properties of the animal-environment system. *Ecological Psychology*, 15(2), 115–134.
- Strong, D. M., Volkoff, O., Johnson, S. A., Pelletier, L. R., Tulu, B., Bar-On, I., Trudel, J. & Garber, L. (2014). A Theory of Organization-EHR Affordance Actualization. *Journal of the Association for Information Systems*, 15(2), 53–85.
- Sutcliffe, A., Gonzalez, V., Binder, J., & Nevarez, G. (2011). Social Mediating Technologies: Social Affordances and Functionalities. *International Journal Of Human-Computer Interaction*, 27(11), 1037-1065
- Svoronos, T., Mjungu, D., Dhadialla, P., Luk, R., & Zue, C. (2010). CommCare: Automated Quality Improvement to Strengthen Community-Based Health. The Need for Quality Improvement for CHWs. Retrieved from <http://d-tree.org/wp.../Svoronos-Medinfo-CommCare-safe-pregnancy1.pdf>.
- Tang, J., Zhao, Y., & Zhang, P. (2011), “Perceived affordances of web advertisements: Implications for information artifacts design”, Proceedings of the Fifth China Summer Workshop on Information Management (CSWIM), Harbin, China, June 25-26.
- Thapa, D., & Sein, M. K. (2017). Trajectory of Affordances: Insights from a Case of Telemedicine in Nepal. *Information Systems Journal*, 28(5), 796–817.
- Thapa, D., & Hatakka, M. (2017). Understanding ICT in ICT4D: An Affordance Perspective. Paper presented at the *Proceedings of the 50th Hawaii International Conference on System Sciences*.
- Thompson, M. (2003). ICT, Power, and Developmental Discourse: A Critical Analysis. In Wynn E.H., Whitley E.A., Myers M.D., DeGross J.I. (eds) *Global and Organizational Discourse about Information Technology*. IFIP — The International Federation for Information Processing, Vol 110. Boston, MA: Springer.
- Thompson, M. (2012). People, practice, and technology: Restoring Giddens' broader philosophy to the study of information systems. *Information and Organization*, 22(3), 188-207.
- Tim, Y., Pan, S. L., Bahri, S. & Fauzi, A. (2017). Digitally Enabled Affordances for Community-Driven Environmental Movement in Rural Malaysia. *Information Systems Journal*, 28(1), 48-75.
- Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item for interviews and focus groups. *International Journal for Quality in Health Care*, 19, 349–357.

- Tong, Y., Tan, C. & Teo, H. (2017). Direct and Indirect Information System Use: A Multimethod Exploration of Social Power Antecedents in Healthcare. *Information Systems Research*, 28(4), 690-710.
- Trading Economics. (2020). *India - Rural Population - 1960-2019 Data | 2020 Forecast*. Tradingeconomics.com. Retrieved 12 September 2020, from <https://tradingeconomics.com/india/rural-population-percent-of-total-population-wb-data.html>.
- Treem, J. W., & Leonardi, P. M. (2013). Social media use in organizations: Exploring the affordances of visibility, editability, persistence, and association. *Annals of the International Communication Association*, 36(1), 143–189.
- UNDP. (2018). *Human Development Indices and Indicators: 2018 Statistical Update. Briefing note for countries on the 2018 Statistical Update*. United Nations Development Programme. Retrieved from <http://hdr.undp.org/sites/default/files/Country-Profiles/IND.pdf>.
- Uphoff, N. (2005). Analytical Issues in Measuring Empowerment at Community and Local Levels. In D. Narayan, *Measuring Empowerment: Cross Disciplinary Perspectives* (pp. 219-247). World Bank.
- Van Osch, W., & Mendelson, O. (2011). A typology of affordances: Untangling sociomaterial interactions through video analysis. In *Proceedings of the 32nd International Conference on Information Systems: Shanghai*.
- Ved, R., Scott, K., Gupta, G., Ummer, O., Singh, S., Srivastava, A., & George, A. (2019). How are gender inequalities facing India's one million ASHAs being addressed? Policy origins and adaptations for the world's largest all-female community health worker programme. *Human Resources for Health*, 17(1).
- Volkoff, O., & Strong, D. M. (2013). Critical Realism and Affordances: Theorizing IT-Associated Organizational Change Processes. *Management Information Systems Quarterly*, 37(3), 819–834.
- Volkoff, O., & Strong, D. M. (2017). Affordance Theory and How to Use It in IS Research, in Galliers, R. D. and Stein, M.-K. (eds) *The Routledge Companion to Management Information Systems*. New York: Routledge, pp. 232–245.
- Wahid, S., Munar, W., Das, S., Gupta, M., & Darmstadt, G. (2019). 'Our village is dependent on us. That's why we can't leave our work'. Characterizing mechanisms of motivation to perform among Accredited Social Health Activists (ASHA) in Bihar. *Health Policy and Planning*.
- Walsham, G. (1993). *Interpreting information systems in organizations*. Chichester, UK: Wiley.
- Walsham, G. (1995). Interpretive Case Studies in IS Research: Nature and Method. *European Journal of Information Systems*, 4(2), 74-81.

- Walsham, G. (2002). Cross-cultural software production and use: A structurational analysis. *MIS Quarterly*, 26(4), 359-380.
- Walsham, G. (2006). Doing interpretive research. *European Journal of Information Systems*, 15, 320-330.
- Walsham, G. (2017). ICT4D research: reflections on history and future agenda. *Information Technology for Development*, 23(1), 18-41.
- Walsham, G., & Sahay, S. (1999). GIS for district-level administration in India: Problems and opportunities. *MIS Quarterly*, 23(1), 39-66.
- Walsham, G., & Sahay, S. (2005). Research on Information Systems in Developing Countries. *Information Technology for Development*, 12(1), 7-24.
- Walsham, G., & Sahay, S. (2006). Research on information systems in developing countries: Current landscape and future prospects. *Information Technology for Development*, 12(1), 7-24.
- Wang, H., Wang, J., & Tang, Q. (2018). A Review of Application of Affordance Theory in Information Systems. *Journal of Service Science and Management*, 11(01), 56-70.
- Webb, B., & Webb, S. (1932) *Methods of Social Study*, London: Longmans Green
- Webster, F. (1995). *Theories of the Information Society*. London: Routledge.
- Wellman, B., Quan-Haase, A., Boase, J., Chen, W., Hampton, K., Díaz, I., & Miyata, K. (2006). The Social Affordances of the Internet for Networked Individualism. *Journal Of Computer-Mediated Communication*, 8(3), 0-0.
- Wheeler, D. (2008). Empowerment Zones? Women, Internet Cafés, and Life Transformations in Egypt. *Information Technologies and International Development*, 4(2), 89-104.
- White, A., Thomas, D., Ezeanochie, N., & Bull, S. (2016). Health Worker mHealth Utilization. *CIN: Computers, Informatics, Nursing*, 34(5), 206-213.
- Whittington, R. (1992). Putting Giddens into Action. *Journal of Management Studies*, 29(6), 693-712.
- Willcocks, L. (2004) Foucault, Power/Knowledge, and Information Systems: Reconstructing the Present. In Mingers, J., Willcocks, L (eds.), *Social Theory and Philosophy for Information Systems*. Chichester: Wiley, 238-296.
- World Health Organization. (2017). *Tuberculosis (TB): Frequently asked questions on Global Task Force on digital health for TB and its work*. Geneva, Switzerland: Author. Retrieved from <https://www.who.int/tb/areas-of-work/digital-health/faq/en/>

World Health Organization. (2020). WHO launches new guideline on health policy and system support to optimize community health worker programmes. (2020). Retrieved 4 August 2020, from <https://www.who.int/hrh/community/guideline-health-support-optimize-hw-programmes/en/>

World Health Organization. Regional Office for South-East Asia. (2019). *THE WHO INDIA COUNTRY COOPERATION STRATEGY 2019–2023: A TIME OF TRANSITION* (pp. 9-13). WHO.

Yazan, B. (2015). Three Approaches to Case Study Methods in Education: Yin, Merriam, and Stake. *The Qualitative Report*, 20(2), 134-152.

Yin, R.K. (2003). *Case Study Research – Design and Methods*, 3rd ed. Newbury Park, CA: Sage Publications.

Zammuto, R. F., Griffith, T. L., Majchrzak, A., Dougherty, D. J., & Faraj, S. (2007). Information technology and the changing fabric of organization. *Organization Science*, 18(5), 749–762.

Zhang, P. (2008). Motivational affordances: fundamental reasons for ICT design and use. *Communications of the ACM*, 21(11) 145-147.

Zhao, Y., Liu, J., Tang, J., & Zhu, Q. (2013). Conceptualizing perceived affordances in social media interaction design. *Aslib Proceedings*, 65(3), 289-303.

Zheng, Y. (2015). Overview of Theories in ICT4D. *The International Encyclopedia of Digital Communication and Society* in P. Hwa (Ed.), *International Encyclopedias of Communication Series*. Wiley-Blackwell.

Zheng, Y., & Stahl, B. (2011). Technology, capabilities, and critical perspectives: what can critical theory contribute to Sen's capability approach? *Ethics and Information Technology*, 13(1), 69-80.

Zheng, Y., & Walsham, G. (2008). Inequality of what? Social exclusion in the e-society as capability deprivation. *Information Technology & People*, 21(3), 222-243.

Zheng, Y., & Yu, A. (2016). Affordances of social media in collective action: The case of free lunch for children in China. *Information Systems Journal*, 26(3), 289–313.

Zheng, Y., Hatakka, M., Sahay, S., & Andersson, A. (2018). Conceptualizing development in information and communication technology for development (ICT4D). *Information Technology for Development*, 24(1), 1-14.

Zimmerman, M. (1995). Psychological empowerment: Issues and illustrations. *American Journal of Community Psychology*, 23(5), 581-599.

Zimmerman, M., & Rappaport, J. (1988). Citizen participation, perceived control, and psychological empowerment. *American Journal of Community Psychology*, 16(5), 725-750.

Zuboff, S. (1988). *In the Age of the Smart Machine: The Future of Work and Power*. New York, NY: Basic Books.

Appendix

The appendix starts from the next page. It includes a table containing the quotations of the interviewees and its formation to raw codes, analytical codes, and finally to the dominant themes of empowerment and disempowerment of CHWs.

Theme	Analytical Code	Code	Raw codes/categories	Participant Quotes
CHW Disempowerment: - Reinforcement of existing issues and control by the state	Infrastructure issues	Poor electricity Hardware faults Lack of charging points	Poor connectivity Poor data sync Fear of data loss Technical glitch Poor electricity and connectivity supply	<p>Jaya: “every time the tablet runs out of battery, we need to go to the PHC centre to charge it”.</p> <p>Seema: “The tablet does not always catch a signal, so we need to go all the way to the PHC centre to sync the data”.</p> <p>Sarika: “We are scared that the district officer might hold us accountable if we lose the data, due to some technical glitch”.</p> <p>Bhagya: “electricity in the villages is constantly going away, so we need to take our tablets to the PHC centre, to ensure that it gets charged and synced there”.</p> <p>Bhavna: “it is constantly raining here, so we keep having electricity and connectivity issues”</p>
	Accountability	Surveillance	Real time tracking GPS dashboard Sending reminders Questioning during the PHC meeting	<p>(PHC staff) Nagendra: “the dashboard at the PHC centres can now geographically monitor the progress of the CHWs”.</p> <p>(mHealth engineer) Anita: “the reminder feature also ensures that if any CHW is running behind her tasks, she is reminded to do the task”.</p>

		<p>Process Efficiency</p> <p>Reduction in data loss Reduction in data error Reduction in data lag Target completion Fear of data loss Data duplication Correct Allocation of governmental pregnancy schemes Improved emergency case management Improved delivery of health information</p>	<p>Nagendra: “we make it a point now to involve or question the CHWs during our weekly and monthly meetings, as they are the primary users of the tablet and hence, we cross-check with them on certain data when required”</p> <p>“it’s not like we didn’t trust the CHWs before, as they are the ones who collect data from the beneficiaries and interact with them, but with the improvement in data collection our trust has improved on them”.</p> <p>“The trust and accountability factor has greatly increased as now we are able to maintain the accountability of health workers. The tablet stores the details of all the beneficiaries and their designated health worker, so if a CHW does not fill in the required data for the day, we can immediately track which health worker is responsible for it”.</p> <p>Village Health Committee Member: “Initially, there used to be huge problems when it came to correctly allocating the pregnancy scheme to the correct beneficiary due to the data having lots of errors and delay, but the improvement in the data quality has helped in the correct allocation”.</p> <p>Bhavna: “What is this, our routine job of conducting house to house visits is any way hard as it is, and now we are being watched! We would like our space and freedom to do our tasks when it is suitable for us.”</p>
--	--	---	---

				<p>Kiran: “We are scared that the district officer might blame us if we lose the data, due to some technical glitch, so we collect the data in registers and in the tablet”</p>
	Reinforced Workload	<p>Increase in the number of tasks.</p> <p>Dual data collection</p> <p>Increased commute to PHC centres</p>	<p>Collection of beneficiary ID information</p> <p>Collecting data in registers and tablets</p> <p>Additional visits to the PHC for charging the tablet and syncing the data.</p>	<p>Sarika: “Initially we had to fill in registers with the information we collected in our routine visits and those registers would be then sent to the PHC centre. But now since the use of the tablet we had to take all the already existing information about our patients and their families from the registers and put it in the tablet and collect beneficiary identification (ID) data, while doing our routine visits! Too much work, and then we also have to go home and take care of our own families”.</p> <p>Bhagya: “You see in the beginning of using the tablet, we were also going from one house to another to collect their identification information. So now if someone loses their ID card or forgets to get it to the PHC or sub-centre, they can still come and get treated as their identification information is digitally recorded.”</p> <p>Supriya: “during busy period, it becomes quite tiring to go all the way back to the PHC centre to sync the data or charge the tablet as there is better connectivity and electricity there, especially when I am in the middle of collecting beneficiary information. Sometimes the tablet would have to be left there (PHC centre) overnight for charging which means I would have to travel all the way to the PHC centre again to pick up the tablet”.</p>

	Demotivation	<p>Alienation of tier 2 CHWs</p> <p>Increased tasks</p> <p>Dual data collection</p> <p>Increased commute to PHC centres</p> <p>Surveillance</p>	<p>Feeling excluded</p> <p>Collection of beneficiary ID information</p> <p>Collecting data in registers and tablets</p> <p>Additional visits to the PHC for charging the tablet and syncing the data.</p> <p>Real time tracking GPS dashboard Sending reminders Questioning during the PHC meeting</p>	<p>Yashti and Rajeshri: “We were the biggest support they (tier 1 workers) had before. The process of filling up 25-30 registers and then reporting it to the PHC centre was not an easy task. Many a times we would relieve them of some of the burden by doing the household visits ourselves and reporting to them who would then fill the register. But since they have started using the technology, they do not involve us as much, they want all the recognition for themselves! We request the supervisor at the PHC centre sometimes, to let us use the tablet as well.</p> <p>Sarika: “Initially we had to fill in registers with the information we collected in our routine visits and those registers would be then sent to the PHC centre. But now since the use of the tablet we had to take all the already existing information about our patients and their families from the registers and put it in the tablet and collect beneficiary identification (ID) data, while doing our routine visits! Too much work, and then we also have to go home and take care of our own families”.</p> <p>Supriya: “during busy period, it becomes quite tiring to go all the way back to the PHC centre to sync the data or charge the tablet as there is better connectivity and electricity there, especially when I am in the middle of collecting beneficiary information. Sometimes the tablet would have to be left there (PHC centre) overnight for charging which means I would have to travel all the way to the PHC centre again to pick up the tablet which leads to delays in the start of our day”.</p>

				<p>Bhavna: “What is this, our routine job of conducting house to house visits is any way hard as it is, and now we are being watched! We would like our space and freedom to do our tasks when it is suitable for us.”</p> <p>Nagendra: “the reminder feature also ensures that if any CHW is running behind her tasks, she is reminded to do the task”</p>
<p>Psychological Empowerment of CHWs</p>	CHW enhancement	Increase in confidence	<p>Improved perception and trust by the PHC staff</p> <p>Improved perception by the community members</p> <p>Improvement in management of emergency cases</p> <p>Improved communication with the PHC staff</p> <p>Improved interactions with the community members</p> <p>Reduction in data errors</p> <p>Reduction in data lag</p>	<p>Bhagya: “we feel more appreciated now for the work we do, the PHC supervisor blames us less”</p> <p>Seema: “We feel motivated to do our job now. Before, even the community members would blame us for not being able to deal with emergency situations. But today we have more confidence when it comes to dealing with emergency cases. We feel happy to be able to serve our community and get recognized for it”.</p> <p>Sarika: “We feel more valued by the community for what we do today. The PHC staff take us more seriously now and sometimes the PHC staff now even ask for our opinion, especially when it comes to certain serious cases. They ask our opinion when they are going through the beneficiary information that has been put by us in the tablet”.</p> <p>Kiran: “I now feel ‘khushi’ (happiness) with the way we are perceived by the PHC staff because now the PHC staff actually looks at us as if we are important.”</p>

				<p>Before we would be scolded in our weekly and monthly meetings about the lag and the mistakes in the information, we collected but today they rely on our feedback and even cross check with us on the information recorded in the health tablet with our observations made during the house-visits, especially if it is a severe case. It is a nice feeling. We feel ‘khushi’ (happiness) now that our self-worth in the eyes of the PHC centre has increased.”</p> <p>Nagendra: “although we always trusted the judgment of the health workers as they are the ones who directly interact with the community, but due to the poor data quality it was difficult to take their judgment on the patients seriously...the data was of poor quality because of them... the registers reported to us would be filled with mistakes and delays. But today they are the primary users of the tablet itself and are also the ones who put the data in it which is then reported to us. This improvement in reporting has increased our trust on them, the data has less errors and as soon as the tablet catches connectivity it syncs the data collected by them into the PHC computer system”.</p> <p>Mahesh: “The tablet has also become a source of information delivery for the health workers. They can use the tablet when they are having their regular interactions with the community and to impart health knowledge. I think this is greatly helping the health workers in improving the quality of information they give to the community members.”</p>
		Increase in self-efficacy	Improvement in management of emergency cases	<p>Mahesh: “The improvement in the data quality, ensures that CHWs give us more up to date and correct</p>

			<p>Improved communication with the PHC staff</p> <p>Improved interactions with the community members</p> <p>Correct allocation of government pregnancy schemes</p> <p>Increase in process efficiency</p>	<p>information, helping us allocate the correct governmental pregnancy schemes”</p> <p>Meenakshi and Village Health Committee member: “so many times it has happened that the right pregnancy scheme does not get allotted, and women who need the money for their pregnancy miss out the opportunity, but with the improvement in the data quality that the CHWs are giving us, we are able to do this allotment correctly now”.</p> <p>Bhagya: “before when we would collect data in the registers the PHC staff would blame us, for not being able to meet emergency case needs because the data would be filled with errors, but today that has improved, the tablet starts beeping red, in front of the beneficiary who needs immediate help and we call the PHC centre and let them know, this is causing the community members to blame us less”</p> <p>Sarika: “But now our communication has improved because of the tablets. When we call them to gather them around, they come out and listen to us out of curiosity of seeing the tablet. We are now able to make it more interesting for them to listen and understand what we are teaching, for example, orally explaining about HIV becomes extremely difficult especially to young adults. As it is a sensitive topic, young boys often feel shy or are reluctant to listen to what we have to say to them and often times they even shun us or run away from us! But the very same issue when shown through a video given to us by the PHC centre in the tablet, captures the attention of the beneficiaries and makes the understanding much more interactive. Even</p>
--	--	--	--	--

				teenage boys sit and watch the video and are willing to listen to us about AIDS related issues”.
		Increase in Motivation	<p>Improved perception and trust by the PHC staff</p> <p>Improved perception by the community members</p>	<p>Binita: “We feel good about doing what we do today. The ability to explain sensitive health information to the members of the community has improved our perception in their eyes, making us feel more motivated to do our job”.</p> <p>Sarika: “even on the monthly village, health and nutrition day, it is we who gather the community members and talk to them about issues of health nutrition and sanitation. It makes us feel important and gives us a little more authority at the community level on how to deliver health education”.</p>
		Increase in Recognition	<p>Improved perception and trust by the PHC staff</p> <p>Improved perception by the community members</p>	<p>Kiran: “I now feel ‘khushi’ (happiness) with the way we are perceived by the PHC staff because now the PHC staff actually looks at us as if we are important. Before we would be scolded in our weekly and monthly meetings about the lag and the mistakes in the information, we collected but today they rely on our feedback and even cross check with us on the information recorded in the health tablet with our observations made during the house-visits, especially if it is a severe case. It is a nice feeling. We feel ‘khushi’ (happiness) now that our self-worth in the eyes of the PHC centre has increased.”</p> <p>Sarika: “But now our communication has improved because of the tablets. When we call them to gather them around, they come out and listen to us out of curiosity of seeing the tablet. We are now able to make</p>

				<p>it more interesting for them to listen and understand what we are teaching, for example, orally explaining about HIV becomes extremely difficult especially to young adults. As it is a sensitive topic, young boys often feel shy or are reluctant to listen to what we have to say to them and often times they even shun us or run away from us!</p> <p>But the very same issue when shown through a video given to us by the PHC centre in the tablet, captures the attention of the beneficiaries and makes the understanding much more interactive. Even teenage boys sit and watch the video and are willing to listen to us about AIDS related issues”.</p> <p>Seema: “We feel motivated to do our job now. Before, even the community members would blame us for not being able to deal with emergency situations. But today we have more confidence when it comes to dealing with emergency cases. We feel happy to be able to serve our community and get recognized for it”.</p>
--	--	--	--	--